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ABSTRACT

This document contains 15 papers from the information technology (IT) in vocational education and training (VET) section of an international conference on VET for lifelong learning in the information era. The following papers are included: "Adapting the System of Continuing Vocational Education for the 3rd Industrial Revolution--Experiences from the Swedish Pilot Project with AVE (Advanced Vocational Education)" (Mats Lindell); "A Flexible Investment: The Australian VET Sector's Framework for Applying New Technologies in Learning" (Sandra Lerch, Peter Le Cornu); "E-Portfolio: More Than an Electronic Resume" (N. Faye Angel); "A Joint Venture in Distance Education Program between Hong Kong and Australia" (Fun-ting Chan, John Messing); "An Evaluation of a Model Multiple Site Distance Learning Program for Non-traditional Students" (Dale E. Thompson, Betsy Orr, Kit Brooks, Cecelia Thompson); "How to Teach Students in the Information Era?" (K.C. Chu); "Integrating Adult Learning Principles in Web Based Open Learning" (Shyamal Majumder); "Integrating the Strengths of the Web-Based and Traditional Models of Teaching" (T.Y. Leung, Sarah Y.S. Tran); "Web-Site Teaching: Analysis of Its Future Development" (Ying Wai Peter Chiu); "Using the Web to Enhance Language Teaching and Learning and

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Distributed Cognitions in a Conventional Sub-degree Setting" (Wanda W.Y. Lau); "The Effectiveness of Using Technology to Teach English as a Second Language" (Rita Yuk Kwan Ng); "Web-Based Vocational English: Development, Practice and Problems" (Kim Hung Martina Chan, Chi Ming Lee); "Establishing a Virtual Building and Construction Site for Education and Training" (John F. Barrett, Brian Wilkins); "The Webvolution's Impact on Vocational Classrooms and Administration" (Elaine S. Stith); and "Audio and Video Development for Multimedia and Web-Based Applications" (Teresa Yohon). Most papers contain substantial bibliographies. (MN)

Paper Presentations

Session D

IT in Vocational Education Training

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ADAPTING THE SYSTEM OF CONTINUING VOCATIONAL EDUCATION FOR THE 3RD INDUSTRIAL REVOLUTION – EXPERIENCES FROM THE SWEDISH PILOT PROJECT WITH AVE¹

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Index words: Advanced vocational education, Continuing vocational training, Information- and communication technology, labour market transformation.

Abstract: This paper analyses problems associated with adapting the system of continuing vocational education (CVT) to the rapidly changing Swedish labour market. The key question asked in the paper is how CVT is going to adapt to a labour market characterised by a growing IT-economy. The paper also presents empirical data from the pilot project in Sweden called *Advanced Vocational Education*. AVE is a new form of post-secondary education designed to meet changing technology and skill requirements. The paper concludes that AVE is a step in the right direction in decreasing the gap between demand and supply.

INTRODUCTION

The Swedish system of Continuing Vocational Training (CVT) has over the last five years been subject to a debate regarding its future content and performance. The reason behind the debate is the primarily problem of how to adapt to the rapidly changing labour market. Fierce international competition, flexible work organisations, together with a general trend of downsizing and outsourcing during the 1990s, helped to create a need for new skills and competencies.

One of the single most important factors behind the transformation of the labour market, is the fast and almost overwhelming evolution of information- and communication technology (ICT). The development, that started in the late seventies, and intensified during the eighties and nineties, to a large extent contributed to, a decrease in some sectors of the economy and growth in the sector of information services. The foundation for the evolution, besides an increasing openness to worldwide technological and economical shift, has been major national investment programs that support research & development and the necessary high technological infrastructure.

The purpose of this paper is that through compilation of available statistics indicators on macro- and sector level from the period of 1990 forward analyse one of the large problems facing the system of CVT and its adapting to the rapid changing labour market. The development of ICT in Sweden also gives the appropriate background when presenting results from the pilot Project with Advanced Vocational Education (AVE). The theoretical framework for the analysis is the economic-historical model that explains the process of labour market transformation in transitions between industrial revolutions.

¹ The author wishes to thank Professor Jan Johansson, Research engineer Jonathan D. Stubbs and Doctoral student Marita Olsson at the Department of Human Work Sciences, Luleå University of Technology for valuable comments on earlier drafts.

LABOUR MARKET TRANSFORMATION IN A THEORETICAL AND EMPIRICAL CONTEXT

According to the economic-historical model of explanation, the process of labour market transformation can be seen as a phase in the transition between two industrial revolutions (Magnusson, 2000). Every revolution has a fixed time length as its existence depends on certain characteristics of industrial production. These generally are performance, planning of work organisation in combination with social and economic conditions in society. The first industrial revolution occurred in Sweden with the introduction of mechanised industry in the middle of 18th century. The second revolution occurred after the Second World War, in the 1940s. In the second industrial revolution the main characteristic was massproduction with Tayloristic methods of work organisation. The transition to the third industrial revolution that we are in now in has its origins, according to the model of explanation, in mid 1970s. This model emphasises long-term changes as influencers. Those changes were; (1) Increasing international economic competition; (2) Changing preferences in the population away from streamlined mass-produced items to designed products reflecting different lifestyles and (3) Innovations and expansion of microelectronics.

Signifying the transition between the second and third industrial revolution is the setback experienced by established sectors of the labour market in terms of employment and economic strength. Competing with the old is a growing service sector with a high dependence on ICT. In Sweden, this development is been very visible where the numbers of employed in the sector of Agriculture, forestry and fishing during the period 1987-1999 have decreased from 4,0 percent to 2,5 percent² (Statistics, 2000b). In economic terms the percentage of GDP changed from 2,34 percent in 1980 to 2,09 percent in 1998. The same development followed in the sector of construction with a drop of 1,16 percent in level of employment. In terms of GDP, the sector of construction fell from 6,74 percent in 1980 to 5,00 in 1998 (Statistics, 2000a).

In terms of expansion is the sector of information services provides a remarkable example. The expansion has its roots in heavy investment programs financed by the government starting in the late seventies. For example, the state owned phone company, Telia, invested during the period 1992-1994 4,5 billion US \$ in upgrading its networks and telecommunications systems (Statistics, 1993). In 1993 total expenditures on research & development amounted to 7.4 billion US \$, which was equivalent to 3,3 percent of Sweden's GDP (Statistics, 1996). From the late nineties, the expansion has continued at a relentless pace. In 1998 total capital investment of ICT in Sweden amounted to six percent of GDP (ISA, 2000).

One of the most significant examples of the dividends that these investments programs have subsequently returned has been in the expansion of ICT. The ICT sector is defined as the sphere consisting of companies within the electronics industry and IT-related enterprises including mobile communication services (Statistics, 1996). A compilation with key figures relating to the expansion of the ICT sector under the 1990s is shown in table 1.

² In comparison, the equivalent level of employment was in 1970 5,7 percent.

Table 1. Key figures on electronics industry and IT-related
Enterprises. Year 1993-1997.

Branch	Electronics industry		IT-related enterprises	
	1993	1997	1993	1997
Companies	800	1 291	8 100	10 928
Employed	46 000	55 360	77 300	126 151
Turnover	57	136	86	237
Investment	2.3	*	4	17

Source: (NUTEK 2000; NUTEK 1996)* Missing data.

Altogether the ICT sector produced in 1993 goods and services to a value equivalent to 3,6 percent of the GDP (NUTEK, 2000). The expenditure for research & development for the year 1993 1.3 billion US \$ for the electronics industry and 0,4 billion US \$ for ICT-related enterprises. In 1997 the cost for R&D had expanded to 1.7 billion US \$ for electronics industry and 0,5 billion US \$ for ICT-related enterprises. Altogether the expenditures within the sector amounted to 16 percent of the total R&D in Sweden (NUTEK, 2000).

On a individual level, these national investment programs has resulted in that about 70 percent of the Swedish population having a computer in their homes today (Rembe, 2000). About seven percent of the Swedish working population are today working in telecommuting occupations with the help of ICT (NUTEK, 1998). In the end of 1999 about 56 percent of the Swedish population, which is about five million people, owned a cellular phone (ISA, 2000).

THE SWEDISH SYSTEM OF CONTINUING VOCATIONAL TRAINING

Over the years Sweden has developed a diversified system for provision of continuing vocational education and training (CVT), which includes sectors with a strong working life orientation. As a system, CVT is affected by changing supply-demand patterns that characterise the training market. According to a common definition (CEDEFOP, 1999) the CVT system until 1996 consisted of:

- Labour market training
- Vocational training within the framework of municipal adult education
- In-company training or staff training
- Short technical programmes at university level

The different components of CVT were, however, very slow responding to the fast development in working life as, for example, technical evolution that called for changes. A report commissioned by the Ministry of Education and Science (SOU, 1995) concluded that there was a need for a drastic improvement with regard to a higher degree of flexibility and swiftness by which CVT answers demands for skilled labour into relevant education programmes upon short notice. The report also concluded, which later European studies has confirmed (CEDEFOP, 2000), that it is not just a matter of increasing the technical skills. On the contrary, development of and flexible work organisations, globalisation and ICT, call for new and different methods for learning a vocation as well as the importance of personal skills. For example, the ability to work and communicate in a team, the ability to think in the abstract, and adaptability to work on a variety of projects at the same time.

ADVANCED VOCATIONAL EDUCATION

To respond to the new demands, in 1996 the Swedish government launched the pilot Project called Advanced Vocational Education (AVE). With AVE, which is a new component of CVT, one-third of course time is devoted to advanced application of theoretical knowledge at a workplace. The intention was that the courses should not be organised along traditional lines, but rather revolve around active workplace-based learning and problem solving in an overall educational context. The length of AVE course programmes ranged from 40 points up to 120 points, where one point is equivalent to one week of fulltime study. Courses were built around close co-operation between enterprise and various course providers such as upper secondary schools, municipal adult education, higher education, and commercial training companies.

During the period from August 1996 to September 1999, the pilot Project with AVE was evaluated. This evaluation which covered about 12 000 students in 200 different programmes was performed by a research group from Luleå University of Technology (SOU, 1999).

The programmes were divided into 12 different branches. The largest branches, with respect to the number of course programmes, were Manufacturing, Business, Tourism and ICT which together enrolled 72 % of the students.

Since AVE was (and still is) open to those coming directly from upper secondary school and those already gainfully employed wishing to develop their skills within a defined area, there was a slight difference in age between students attending AVE and students attending university studies. In AVE, the majority of students (52 %) were between 16 and 24 years old. For students attending university studies, the equivalent number was 48 %. In comparison with regard to sex the differences were similar. In AVE, 53 % of the students was men and 47 % women. For university, the numbers were in fiscal year 1997/98 58 % men and 42 % women.

ICT-PROGRAMMES WITHIN AVE

During the evaluation period, the ICT-sector was the largest of all with 46 different course programmes enrolling almost one-fourth (24 %) of the total student body. Depending on various definitions of IT-branches, approximately between 5 and 7 percent of the working population are employed within that sector, the volume of ICT-programmes at first glance seemed over-enrolled in relation to other sectors. The reason behind expansion was not due so much to the student interesting enrolling the programmes, as much directives by the government giving ICT-programmes high priority.

On an analytical level, the programmes were clustered into four different categories depending on the aim and scope. One category consisting of 16 course programmes was traditional and established systems- and software course programmes. Goals of those programmes were to meet demand for semiskilled workers. A second category was programmes educating for the new area of multimedia and Virtual-reality technology. The 14 course programmes trained the students in a broad introduction to and necessary skills for a future vocation as a Web-designer, producer of interactive CD-ROM, or DVD publications. A third category constituted of 10 course programmes training the students in computer knowledge on a very basic level. The courses were specialised into different sectors and trained students for well-established occupations (e.g., data-entry).

A fourth category constituted of six programmes of a very advanced kind. The programmes trained for very specialised kinds of skills. For example, designing safety systems monitoring computer traffic on the Internet. Other course programmes within this category was advanced courses in Computer Aided Design and Computer Aided Engineering.

DEMAND FOR AVE-STUDENTS GRADUATED FROM ICT-PROGRAMMES

From a survey carried out six months after students graduated it appears that AVE has been favourable in terms of employment after course completion.

Table 2. Occupation six months after graduation.

Occupation	Employed		Continuing to universities	
Sector	NR.	%	NR.	%
Construction	28	80	4	11
Business	173	78	22	10
ICT	142	78	12	7
Agric./forestry	50	71	1	1
Food industry	8	44	0	0
Environment	28	58	14	29
Transportation	50	77	2	3
Manufacturing	177	76	12	5
Wood industry	19	56	2	6
Tourism	121	84	9	6
Care	25	66	1	3
Misc.	24	71	3	9
Total	845	75	82	7

Source: (SOU, 1999)

Table 2 show that of the former AVE students, an overall average of 75 % have been employed. Of the students that graduated from course programmes within the ICT-sector, approximately 78 % of the students were employed. Furthermore, 4 % of the students reported that they had started their own company, which gives a "success rate" of 82 %. The survey also conveyed that 13 % were unemployed and that 7 % continued to further studies at the university level.

CONCLUDING COMMENTS

AVE is an important contribution for the CVT system. The research results implicate that AVE in its first years has had a favourable outcome with regard to employment rate. One important explanation behind this is the active workplace learning instead for traditional classroom learning and close co-operation with industry designing the courses. For the students this means that they, at an early phase of their education, get the chance to meet potential employers. This is otherwise a common problem. The employers, on their hand, gives through interaction with AVE administrators, the opportunity to receive the kind of workforce, with regard to skills, that are demanded for.

There are, however, some problems with AVE, in terms of ICT courses, today. The relatively low skill level offered in AVE courses might be explained by the fact that there is no basic ICT

education at the high school level in Sweden. This means that ICT education can only begin after a student has completed their basic high school curriculum. This is not an ideal state since AVE is supposed to be more advanced vocational education that can supply industry and commerce with workers having a relatively broad array of ICT skills and qualifications. There is a risk, that the students after leaving an AVE course must learn additional skills on the job as their qualifications do not precisely match with the skill requirements of industry. In the growing economy of today industry is willing to overlook skill deficits as long as the former students grasp basic skills and concepts. At this time industry is willing to do some training of new employees. Should the economy slow down it may well be that graduating students will find that their array of skills will not be viewed as adequate by potential employers. It is important to acknowledge that there are some specialised and advanced course programmes that already meet the criteria of flexibility and high skill level, but in regard to the fast economic and technological development described earlier, those few are only the beginning.

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A FLEXIBLE INVESTMENT: THE AUSTRALIAN VET SECTOR'S FRAMEWORK FOR APPLYING NEW TECHNOLOGIES IN LEARNING

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Index: Flexible learning, educational partnerships, lifelong learning

Abstract: In 1999, the Australian VET sector developed a five-year strategic plan, Flexible Learning for the Information Economy: A Framework for National Collaboration in Vocational Education and Training 2000-2004. Known commonly as the Collaborative Framework, the plan is a fluid platform upon which the Australian VET sector can strategically plan for the use and expansion of learning technologies in training and industry. This paper will explore the Collaborative Framework not only as an integrated policy response to the emergence of new learning technologies, but also as a model of collaboration between governments and a bold experiment in cultural change within the VET sector.

INTRODUCTION

The role of government in the adoption of new learning technologies has often been limited to the provision of regulatory and infrastructure systems. It is an approach premised on the belief that the participation of government in substantive matters of staff professional development and online resources acts only to constrain the innovation and responsiveness of education services. The Australian vocational education and training (VET) sector has recently revisited this issue in response to concerns over the quality, consistency, cost and broad adoption of new learning technologies in the sector. Their response to the innovation / consistency conundrum are interesting in both policy and practice.

In 1999, the Australian VET sector developed a five-year strategic plan, Flexible Learning for the Information Economy: The Framework for National Collaboration in Vocational Education and Training 2000-2004. Known commonly as the Collaborative Framework, the five year plan is a fluid platform upon which the Australian VET sector can strategically plan for the use and expansion of learning technologies in training and industry. In articulating this role, however, the Collaborative Framework raises a range of questions about the role and challenges of government in planning for learning technologies:

- Can coherent technology policy emerge in a federalist government environment, and what are the implications for education policy planning and innovation?
- Is government involvement intrinsically at odds with innovation and the creation of a dynamic, responsive education system? What kinds of innovation and dynamism might emerge from government collaboration?

- How do the five goal areas of the *Collaborative Framework* interact to provide an integrated response to the emergence of new learning technologies? Why are they strategically important to the development and expansion of Australia's flexible learning capability?
- How might the *Collaborative Framework* position the Australian VET sector in a competitive global market, when previous attempts at federalist collaboration in education have been less successful? What makes this work where others have failed?

This paper will focus on these four questions, before turning to consider future iterations of governmental collaboration in the VET sector within and outside of Australia.

AUSTRALIA'S FEDERALIST SYSTEM OF GOVERNMENT AND ITS IMPACT ON VET POLICY

The need for a national collaborative approach to flexible learning in the VET sector is in part a consequence of Australia's federalist structure of government. The jurisdictional complexity of the Australian education sector, combining the Commonwealth government as well as eight separate State and Territory jurisdictions, has meant that VET policy has evolved in neither a systematic nor consistent manner. Indeed, States and Territories assumed responsibility for the majority of VET policy in their jurisdictions until 1987, when the Commonwealth developed policy platforms that for the first time directly linked VET with issues of national economic development and wealth (Mitchell, Robertson and Shorten 1999:107). A particular interest in national collaboration on flexible learning issues in VET did not emerge, however, until 1995, when a National Taskforce on Flexible Delivery was formed (National Flexible Delivery Taskforce 1996).

While the origins of a coherent policy framework for flexible learning in Australian VET can be traced to 1995, the consequences of inadequate planning were already apparent. States and Territories first began to expand their flexible learning activities in the 1990s, but this expansion occurred largely in isolation, with limited collaboration across jurisdictions. The most salient outcome of this atomistic approach was the lack of interoperability of many infrastructure networks, which resulted in increased service duplication, inefficiency and cost for States and Territories. Issues of equity and choice became paramount, with both industry and learners experiencing a restricted range of training market options. Against this background, the provision of VET services lacked genuine flexibility, and in its piecemeal development and delivery, offered little strategic or economic advantage to the nation. The need for a collaborative policy framework for the expansion of flexible learning services in VET was identified, but with this need, emerged a debate concerning the most appropriate model for cross-government collaboration.

CREATIVE INNOVATION AND THE ROLE OF CATALYTIC GOVERNMENT

At issue was the dilemma of how to promote the expansion and export of training services that utilise new learning technologies, without constraining the sector's innovation and responsiveness in a competitive global training market. It was clear that some degree of government support would be necessary to ameliorate the impact of expensive infrastructure costs. But it was also apparent that Australia's position in the training market was just as dependent on intellectual infrastructure as it was on cabling and satellite links. In 1999, the *Collaborative Framework* was developed to meld traditional notions of infrastructure, government regulation and facilitative support, with new and largely experimental approaches to the development of people, skills, and online services and content. It is a framework that reiterates the important catalytic role governments assume in

working collaboratively together to encourage innovation, and to support the adoption of new learning technologies.

Central to this catalytic role of government is the importance placed on partnerships between key stakeholders within and beyond the VET sector. Most notably, cooperation between the VET industry and the private sector has brought new markets and enormous innovation to the public VET sector. These private-public linkages were not without precedent; in 1998, multimedia companies worked cooperatively with VET providers and governments to develop the *Toolbox* project, which produced online training programs for national Training Packages (Australia's nationally recognised courses of training). The *Collaborative Framework* sought to build on these successful partnerships, and while such cooperative activities introduce a degree of risk in policy and practice, the partnership model is designed as a facilitating mechanism for the provision of creative and innovative flexible learning solutions (EVAG 2000a:15).

SEAMLESS SOLUTIONS: THE FIVE GOALS OF THE COLLABORATIVE FRAMEWORK

The *Collaborative Framework* was developed by the VET sector in response to a discussion paper prepared by Australia's National Office for the Information Economy. This discussion paper was designed to address the expansion of the information economy in a diverse range of industry sectors in Australia, and the *Collaborative Framework* represents the VET sector's response to this call for an integrated strategic approach to technology issues.

The *Collaborative Framework* contains five goals, which were selected on the basis of their strategic importance for VET in Australia's transition to the information economy. These goals require a national collaborative effort if optimum results are to be achieved (EVAG 2000a). The goals are:

- Goal 1: Creative, Capable People
- Goal 2: Supportive Technological Infrastructure
- Goal 3: World-Class Online Content Development, Applications and Services
- Goal 4: Enabling Policies
- Goal 5: Problem-Solving Regulation

It is useful to briefly explore the scope and content of each of the five goals.

Creative, capable people: aims to accelerate Australia's transition to the information economy through developing the skills of VET staff in the use of flexible learning approaches (EVAG 2000b:7). The goal travels beyond conventional notions of professional development, to embrace a suite of online conferencing, business planning and research tools that reflect the breadth of experiences VET staff require to work effectively in flexible learning.

Supportive technological infrastructure: aims to provide affordable access to online training services for use by communities, learners and employers. The goal supports the use of advanced and interoperable communication technologies in the VET sector, to support the application of new technologies in both training and business processes (EVAG 2000b).

World-class online content development, applications and services: aims to maintain and expand the VET sector's share of the training market both in Australia and internationally (EVAG 2000b). A diverse range of initiatives support this aim, including the development of online training

products, quality assurance supports, VET sector e-commerce activities, and online student services.

Enabling policies: aims to ensure that national VET policies and protocols support the use and expansion of flexible learning opportunities. The goal focuses on the construction of consistent policy frameworks across States and Territories, and developing data collection and performance measurement systems which support and reflect flexible learning activities (EVAG 2000b).

Problem-solving regulation: aims to improve the Australian legal and regulatory framework to further support the use of new technologies in the VET sector. In partnership with other education and training sectors, the goal will focus on providing consumer protection for learners, exporting Australian VET products and services, and removing any legal and regulatory barriers which restrict the use and expansion of information technology in VET (EVAG 2000b).

The five goals outlined in the *Collaborative Framework* provide a strategic platform for the expansion of new learning technologies in the Australian VET sector. However, the success of this expansionary policy is dependent on the implementation of a range of supporting projects, managed largely at the State and Territory level. The projects span all five goal areas, and cover a range of strategic policy and operational issues. There are 26 projects in total, all of which are outlined in *Strategy 2000*, the implementation plan which supports the *Framework* in 2000. In all, up to \$20 million in funding is available each year to support the five-year *Framework*.

To maintain the fluidity and responsiveness of the five-year plan, a new Strategy will be developed for each year of the *Framework*. Individual projects will be retained, recast or omitted within each goal area in an annual evaluation process. This continuous evaluation process ensures that the *Framework* remains responsive to the needs of VET clientele, as well as developments in the global VET training market.

An important instrument in the management and communication of the *Collaborative Framework* is the project web site, at flexiblelearning.net.au. This site is the gateway to all *Collaborative Framework* projects and activities, and is due to go online in July 2000.

CRITICAL SUCCESS FACTORS FOR THE COLLABORATIVE FRAMEWORK

The abiding issue for policy makers is the identification of the critical factors that will ensure the continued success of the *Collaborative Framework*. It is true that the competitive nature of the global education market makes competitive collaboration at a national level an urgent imperative of governments at both the Commonwealth and State and Territory level. Yet the extent of cooperation across governments, and their active participation in *Collaborative Framework* policy development and project management, points to other factors relevant to its success.

The *Collaborative Framework* contains seven principles that were designed to guide the direction and values of work undertaken as part of the five-year plan. These principles were agreed upon by the Commonwealth, States and Territories to guide national collaborative activities, and form a critical element in the success of the *Collaborative Framework* (EVAG 2000a:18):

- Shared benefit to all States and Territories
- Strategic use of new learning technologies
- Accelerated take-up of flexible learning methodologies
- Strategic partnerships between governments, VET agencies, and other organisations in the public and private sector
- Leveraged investment of national funds for maximum impact

- Employee involvement in flexible learning practices
- Driven by client demand

These principles operate at two levels. In the first instance, they provide strategic direction for the development and evaluation of policy and project initiatives. However, these principles also operate at a process level, guiding the way in which decisions are made, and providing a structure in which a strong working relationship between the Commonwealth, States and Territories can be maintained.

It is perhaps this issue of process that provides the key to understanding the distinctive nature of the *Collaborative Framework*. A central element in its success resides with the equality and independence of its constituent stakeholders. The policy body responsible for provision of advice on flexible learning issues in Australian VET, the EdNA VET Advisory Group (EVAG), developed the *Collaborative Framework* in consultation with each of its constituent members, drawn from the Commonwealth, the Australian National Training Authority and each State and Territory. Each constituent member has equal weight in policy negotiations. Within this context, the level of collaboration is indeed remarkable, but is a consequence of democratic discussion and shared visions for flexible learning, rather than compulsion. It is this fluidity in the development of policy frameworks that allows the *Collaborative Framework* to remain innovative and responsive, both to the needs of the constituent members, and the external education and technological environment.

The equality and independence of EVAG stakeholders occurs within a wider VET policy environment that is committed to the development of a national system of VET in Australia. This commitment is reflected in the 1992 agreement of the Commonwealth, States and Territories for the establishment of the Australian National Training Authority (ANTA). ANTA's primary policy responsibility is to oversee the development of a national system of VET that ensures that "the skills of the Australian labour force are sufficient to support internationally competitive commerce and industry and to provide individuals with opportunities to optimise their potential" (ANTA 1998; see also www.anta.gov.au). In this context, the *Framework* represents a continuation of broader Australian VET policy, which is mindful of the international developments in new technologies, and their impact on flexible learning in education.

MEASURES OF SUCCESS

Of course, an important component of the *Collaborative Framework* is its continuing commitment to evaluation. The five year plan includes six agreed national outcomes by which the VET sector can measure the success of the *Collaborative Framework* in facilitating the application of new technologies to VET products and services (EVAG 2000). The six outcomes are:

- A high level of learner and employer satisfaction with the quality, quantity and results of online training programs and services
- Increased participation in learning away from an institutional setting
- Increased participation in VET as a result of the use of online technologies, including those groups who have difficulties accessing traditional institution-based training
- Increased investment in flexible learning projects by ANTA, other public organisations, and private sector bodies
- Increased overseas online VET enrolments and revenue earned from those enrolments
- Accumulated case study examples of how the Collaborative Framework has accelerated the use of flexible delivery methods, and improved the quantity and quality of flexible learning in VET

The *Collaborative Framework's* capacity to measure its performance in relation to these six outcomes is limited by current data collection methods. A more robust suite of measures to evaluate VET sector performance is currently under development, and should be available for use in 2001 (EVAG 2000a:19).

FLEXIBLE LEARNING IN 2004 AND BEYOND

The dynamic nature of new technologies will ensure that VET policy planning is a continuing process that extends well beyond the five-year horizon outlined in the *Collaborative Framework*. An important challenge for the Australian VET sector in this climate is to ensure that the policy and planning framework remains relevant to the external world. More than this, however, the *Collaborative Framework* must 'speak' to the clients of the Australian VET sector itself, for without their participation and support, new flexible learning initiatives in the sector will not be taken up. This, then, may be the greatest task of the Australian VET sector: to create a level of excitement and achievement in flexible learning at the local level, in a global market that waits for no-one.

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E-PORTFOLIO: MORE THAN AN ELECTRONIC RESUME

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Index: Portfolio, Electronic, Career, Interactive, Competencies

Abstract: Paper-source portfolios have become instrumental in measuring learning and promoting one's accomplishments. However, they lack an interactive component and are frequently cumbersome to carry and disseminate. On-line career portfolios overcome many of the difficulties of paper-source portfolios and provide additional benefits. This article discusses these benefits along with the caveats of on-line portfolios and responsibilities of the network administrator and students. Visit the e-portfolio website at www.ferrum.edu/portfolio.

INTRODUCTION

Paper-source portfolios have become instrumental in measuring learning and promoting one's accomplishments. However, they lack an interactive component and are frequently cumbersome to carry and disseminate. On-line career portfolios or e-portfolios overcome many of the difficulties of paper-source portfolios and provide additional benefits, including flexibility, accessibility, and interactivity. Job candidates can demonstrate a plethora of skills and abilities in an organized, user-friendly electronic environment. At the same time without adequate resources allocated to the process of developing and maintaining an on-line portfolio, it can become a frustrating and unproductive endeavor. Not only does this article discuss concerns specific to e-portfolios, it also illustrates a recently implemented model of an on-line career portfolio.

BENEFITS

Before discussing the benefits of on-line portfolios, a traditional portfolio needs to be defined. "Port" means portable or to move, and "folio" means leaf or page. Typically, it consists of a hard copy in a ring notebook (usually 14" X 17") often with a zippered closing with a handle. Each piece of work is enclosed in a plastic sheet facing the same direction as other works, and eight to 20 pieces are included. In a few instances, this type of portfolio is still the optimal method for representing one's skills, abilities, and competencies. For example, artists need to exhibit their actual work, if possible. However, as previously stated, on-line portfolios overcome many of the difficulties of paper-source portfolios. In addition, an on-line portfolio remains closely tied to the etymology of portfolio. In general, portfolios provide the following benefits:

- Show achievements
- Document the quality of academic training and experience
- Exhibit professionalism in presentation and domain-specific content
- Demonstrate competencies in foundational and domain-specific areas
- Illustrate problem-solving and critical thinking abilities

- Market self to potential employers
- Display leadership abilities
- Exhibit interest in community

Although these can be powerful reasons to maintain a portfolio, the bottom line is that employers want to do know what you can do, and being able to demonstrate capabilities is becoming a vital component of the interview process. A portfolio embodies direct indicators of learning experiences. A career portfolio could include academic work (written papers, computer projects and audio/video bites), extracurricular activities (newspaper reporter, tutor, performing arts or sports participant), travel experiences (pictures or written accounts), and community service activities (newspaper articles, journal excerpts, or pictures).

For many seeking employment, an on-line portfolio is an inexpensive way to give their work added portability, to demonstrate critical thinking and problem-solving abilities in an interactive medium, and to provide a link to the potential employer without personal contact. For example, an Access program, developed to be user friendly with a nicely designed interface and nested IF functions for complex calculations, cannot be adequately represented with a typical paper portfolio. To be a useful recruiting tool, the employer needs to be able to navigate and manipulate the program to understand the abilities and competencies that were required to create it. E-portfolios provide the perfect venue for such explorations. By making the files read-only, the investigator can plug in his or her own values and observe the program add records, recalculate financial information, or produce a p-chart for quality control. Yet, these modifications will not be saved to the original file, and it remains intact.

Although students and graduates can have a variety of work on-line displaying an array of abilities and competencies, customization can be produced by indicating in a cover letter which entries are applicable for a particular job. The cover letter can also specify which pieces of work exhibit different abilities and competencies. However, this needs to be limited. Employers do not want to read a long laundry list. Nevertheless, having discussed the on-line career portfolio with employers, they indicate that they would definitely visit the website of an applicant that provided them with the Internet address.

CAVEATS

Although on-line career portfolios provide a clear advantage for students and graduates, potential threats to its usefulness must be addressed or they will consume the benefits. When I started this undertaking, I thought I would have the portfolio on-line in three months. Instead, it has taken a year. There were few references to provide assistance; so I learned as I discovered things that worked and, more frequently than not, things that did not work. Although this article is far from comprehensive, hopefully, it will provide a starting point and prevent users from repeating many of my mistakes.

One of the first tasks that needs attention is discussing the project, especially the resource requirements, with the network administrator. If he or she cannot provide the time, server space, backup of files, and daily updated virus protection, the project should not go forward. However, if these resources seem adequate, it is imperative that information be shared between the portfolio administrator and the network administrator. For example, if a server crashes because the disk is full and the files are moved to another server, the portfolio administrator should be notified immediately. Employers are not going to use an on-line service that is frequently off-line. Periodic

meetings between the network administrator and the portfolio administrator might resolve many of these problems.

Another important issue is ensuring that the division chair or supervisor understands the resource requirements, especially that release time will be needed from divisional duties, such as teaching and committee work. Certainly one of the primary reasons the on-line career portfolio was delayed in my undertaking was because I was detained by teaching and committee duties. Release time and/or clerical support is essential if the on-line portfolio is to be updated and maintained in a manner that adequately represents the skills and competencies of the students and graduates. One way of focusing on these activities is to submit a budget for maintenance and audit functions. Keep a log of the time requirements of the on-line portfolio, and submit it with the annual budget.

The network administrator, department chair, and portfolio administrator should determine the level of security that will be imposed on the e-portfolio. Some schools maintaining electronic resumes require employers to obtain a password. However, this restricts its accessibility and may deter its use while increasing time requirements for its maintenance. At the very least, all the files posted on the portfolio should be read-only so that they remain intact even if manipulated by employers. Consent forms should be signed so that students and graduates understand that personal information may be widely disseminated and that their work runs the risk of being plagiarized. Recommend to them that personal information, such as home address, should be kept to a minimum.

The on-line career portfolio should be outcomes-oriented and exhibit work that represents one's ability to meet both general and specific job requirements. Its purpose is not to show improvement or display personal information not related to pursuing employment. It should demonstrate abilities, skills, and competencies sought after by employers, and maintain a high level of professionalism.

Establish an evaluation process and criteria to determine which pieces of work should be posted to the on-line career portfolio. This will vary depending on the student population the portfolio will represent. For college graduates, only work that has been corrected and is error-free should be considered for inclusion on the website. However, students with special needs may have their best work included even if it is only of average quality. Regardless of the quality issue, all posted work should demonstrate identified skills and competencies, especially critical thinking. Limit the number of works that represent similar proficiencies so as not to overwhelm employers as they attempt to determine what students/graduates can do. A few well-selected pieces can adequately depict one's foundational competencies and well as domain-specific knowledge. Above all else, remember that this portfolio represents the school to a wide audience.

The on-line career portfolio should be easy to navigate, allow employers to become quickly oriented to the information provided, and should not upstage the individual work of students. The format for introducing each work should be succinct, yet clearly describe each posting. The background should be black, the font style clear, and the text color bold against the dark background. Please refer to Figure 1 and Figure 2 for an example of the portfolio homepage and an individual website.

Students should be encouraged early in their schooling career to develop quality work for inclusion in the on-line career portfolio. When they graduate, their individual portfolio is complete. Too frequently, they scramble to locate their work as graduation approaches and expect the portfolio administrator to get it on-line yesterday. This creates a difficult situation. If possible, include a portfolio requirement in the syllabus and encourage your colleagues to do the same. Another way to limit this problem is to maintain contact with the students in order that exceptional pieces of work are posted in a timely manner.

The on-line career portfolio must be manageable, otherwise it will be a nightmare to administer. After deciding its purpose, do not stray from it. Do not link to other websites regardless of how useful they might be. Since URLs frequently change, links on the website must be frequently updated increasing the time needed for maintenance. Establish a time period for posting work after graduation. The longer the work is maintained, the more expansive the website becomes. Two years seems to be a reasonable period of time where graduates should be able to build a credible work history that should replace the need for the portfolio. Current contact information, i.e. e-mail address, is essential post-graduation and must be updated on the individual websites as needed.

In order for the on-line portfolio to be successful and meet its purpose, other stakeholders should be brought into the process early. These may not be the same for all institutions but could include career services, admissions, employers, parents, and public relations. These are in addition to the network administrator, department chair, and students. Consider developing an Advisory Board consisting of several of the stakeholders, especially employers for they know what skills and competencies are needed in the workplace and how best to showcase them.

Finally, the on-line career portfolio should have flexibility. Develop a system of managing folders and files that is readily identifiable, easy to link, and can handle a wide variety of file types. This requires some planning, but it is essential. Remember the portfolio will consist of literally hundreds, and perhaps thousands, of files and without proper organization will be unmanageable. In addition, employers should be able to manipulate, observe, print, and download the students' and graduates' files in order to examine them for content, skills, and competencies. At the same time, the files should remain intact and unchanged after the manipulations.

PORTFOLIO ADMINISTRATOR RESPONSIBILITIES

Many of the responsibilities of portfolio administrators were discussed previously. For this reason, this section is more or less a summary listing duties.

- ☐ Develop and maintain portfolio website
- ☐ Maintain contact with network administrator on such issues as security, disk space, and server changes
- ☐ Submit annual budget--including needed release time or clerical assistance
- ☐ Disseminate information to students, employers, and other stakeholders
- ☐ Allocate time for meetings with students, either as a group or individually
- ☐ Inform students of their responsibilities
- ☐ Obtain signed consent form
- ☐ Take possession of files--encourage students to e-mail the files rather than having numerous disks
- ☐ Evaluate quality and appropriateness of work
- ☐ Check files for viruses or other forms of corruption
- ☐ Make backup copies
- ☐ Make files read only
- ☐ Maintain contact with other professors concerning corrected work
- ☐ Modify individual websites as needed with additions and deletions
- ☐ Check modifications

- ❑ Maintain updated contact Information
- ❑ Delete graduates' work two years post graduation
- ❑ Make sure that website is online and URL functioning properly
- ❑ Hold periodic meetings with other stakeholders such as admissions personnel, career services, employers
- ❑ Seek feedback from students, employers, career services personnel, etc. on ways to maximize the use of on-line career portfolio

STUDENT RESPONSIBILITIES

Since the on-line career portfolio is for the purpose of advancing the career aspirations of students, their responsibilities should be clearly delineated and rules concerning them enforced. Each school needs to define what is appropriate for their student body and graduates. However, a limited list of responsibilities follows.

- ❑ Schedule appointment with portfolio administrator
- ❑ Determine competencies to be showcased
- ❑ Provide current resume
- ❑ Provide files of projects--preferably via e-mail
- ❑ Sign consent form
- ❑ Include only work that has been corrected and of high quality
- ❑ Keep portfolio current
- ❑ Provide current contact information
- ❑ Monitor website for accuracy
- ❑ Inform potential employers of website--include URL on resume and cover letter
- ❑ Maintain familiarity with each posted project

Although most of these responsibilities seem self-explanatory, maintaining familiarity with each work needs particular emphasis. Employers seriously considering hiring an applicant will download projects and papers, and study them. During the interview, the candidate should be prepared to answer very specific questions about any portfolio entry. The consequences of not being able to respond appropriately to such inquiries could be unfavorable for the applicant as well as the school.

CONCLUSION

The career e-portfolio is not where I had envisioned it a year ago. Without release time from teaching responsibilities and with significant demands from divisional and committee duties, I continue to struggle to maintain the portfolio with current information and projects. This is a labor-intensive task. Nevertheless, the on-line career portfolio is providing our graduates with an advantage over graduates from more high profile schools because employers can not only observe what they have created, they can interact with their programs and projects. If you have questions or comments, please e-mail them to me at fangel @ ferrum.edu. Please visit the on-line portfolio website at [www.ferrum.edu / portfolio/](http://www.ferrum.edu/portfolio/)

Figure 1

Sample Homepage for Portfolio Website

On-line Career Portfolio		
Ferrum College		
Student/Graduate		Major or Emphasis Area
For additional information, contact Dr. N. Faye Angel fangel@ferrum.edu Ferrum College Homepage Business Division Homepage	Asbeli, Drey	Financial Management
	Blankenship, Nikki	Decision Support Systems
	Brinkley, Amy	Decision Support Systems
	Crossan, Michael	Management, Marketing
	Fortune, Michael	Criminal Justice, Business (minor)
	Green, Patricia	Management
	Hargis, Jack	Financial Management
	Kerstetter, Tommy	International Business
	Kier, Kendrick	Information Systems
	Liffert, John	Decision Support Systems
	Litton, Jason	Accounting, Financial Management
	Long, James	Decision Support Systems
	Marsden, Aaron	Financial Management
	Miller, Janel	Information Systems, Decision Support Systems
	Nichols, Joey	Information Systems
	Pachey, Todd	Financial Management
	Parr, Stephanie	Information Systems

FIGURE 2

Sample Individual Portfolio Webpage

Nikki Blankenship	
Graduation Date: May 2001	
Portfolio Information	
email nblankenship@ferrum.edu	
Resume	
PowerPoint Project--Exercise	
Access Project--Car Rental, Inc.	
Excel Project--Muscle Elite, Inc.	
Desktop Publishing Project--Bank Newsletter	
Quality Control Project	Excel Spreadsheet
Always Ready Appliances, Inc.	Analysis Paper

BEST COPY AVAILABLE

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A JOINT VENTURE IN DISTANCE EDUCATION PROGRAM BETWEEN HONG KONG AND AUSTRALIA

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Index: Distance education, information technology, education partnership

Abstract: This article examines how the use of information technology overcomes some of the difficulties in delivering vocational education at a distance. It then discusses how the collaboration of an overseas institution with a local academic partner can offer an enhanced distance education program. In addition to the reflections of the academic and administrative staff, feedback from the students is collected through a questionnaire survey. The students' general course satisfaction and their opinions to the enhanced form of distance education are investigated. The findings of this case study provide a useful reference for distance education providers to enhance their competitiveness when operating in other countries.

INTRODUCTION

In the information era, there is little limit for an institution to extend its delivery of education from its campus to other places and from its home country to other countries. Distance learning is seen as a solution to provide education and training at a lower cost and with higher flexibility. A common and important question about distance learning concerns its effectiveness when compared with conventional face-to-face teaching. There is no definitive answer to this difficult but important question. We are lacking a universally agreed definition of learning effectiveness as well as being influenced by many confounding factors such as the nature of the course and the cultural background of the learners.

This article does not attempt to answer the above question. Rather, it takes an empirical approach by examining a case study of how distance learning can be enhanced by appropriate combination with face-to-face teaching in a cost-effective manner. In Belanger and Jordan (2000), distance learning is not seen as an all-or-nothing experience. In reality, it is not necessary to assume distance learning must wholly substitute the conventional face-to-face teaching. In a *combined delivery*, part of a course can be delivered via the traditional classroom environment and the other part via distance learning. When an institution provides a distance learning course overseas using the combined delivery mode, it can collaborate with an academic partner at the receiving end so as to keep the cost of the face-to-face teaching component reasonably affordable.

Charles Sturt University (CSU), Australia offers a Graduate Diploma of Applied Science (Information Technology) in Hong Kong in collaboration with the School of Professional and Continuing Education (SPACE) of the University of Hong Kong using the combined delivery mode. In the following sections, we first describe how this course is offered in distance learning mode in Australia and how it is enhanced when transported into Hong Kong. We then discuss the benefits of using two teaching modes together in a course. We follow to report on the feedback of the students and their opinions towards the preferred learning mode. Lastly, we summarize the findings and arguments of the paper in the conclusion section.

THE JOINT VENTURE

Charles Sturt University was established in 1989 by the amalgamation of a number of institutions of higher education. It has a proud record of higher education in Australia spanning more than 100 years and a long tradition of offering education to international students. Distance education is a particular strength and focus at CSU and has opened up opportunities for study by distance learning, for the adult and part time students especially. There are over 28,000 students enrolled in over 150 courses with more than 2,500 different subjects.

The School of Professional and Continuing Education (SPACE) of the University of Hong Kong is the extension arm of the University. Its role is to provide access to career training and education opportunities for the community. In 1999, a course enrolment of over 80,000 was recorded. SPACE offers a number of award-bearing courses in collaboration with overseas universities. In some cases, these courses are in areas that have very strong demand, for example, information technology. In other cases, the courses are in specialized areas that are not formally available in local tertiary institutions, for example, library and information science (Mills and Chan, 1999).

In 1993, the two institutions jointly offered the CSU Graduate Diploma of Applied Science (Information Technology) in Hong Kong. Some people may doubt whether the quality of a distance learning course can be maintained when it is operated in another country with a different culture. The following features are believed to have ensured the academic quality of the course offered in Hong Kong and may even have enhanced the course quality.

DISTANCE LEARNING MATERIAL IS PORTABLE

The fact that distance education material can be physically transported to other places is partly a guarantee of academic quality even though the course is offered overseas. In Australia, students can only study the course in distance learning mode. They only go to the CSU campus for a three-day study school at the beginning of the course and these days, this has even been made optional. They continue their study off campus, based on the study packages supplied by CSU. Assignments are submitted and sent back mainly by mail.

When Hong Kong students take the CSU distance learning subjects, they receive the same study packages. CSU staff visit Hong Kong at least once a year to conduct orientation and the introductory study school. The Hong Kong students enjoy no less teaching support than their counterparts in Australia, despite the fact that they are overseas students. In practice however, the slightly longer mail delivery time for submission and returning of assignments can sometimes be a bit of concern.

TECHNOLOGY ENHANCEMENT

The advancement in technology, especially the telecommunication technology, helps to reduce the barrier of distance. One of the strengths of the Graduate Diploma in Applied Science when it was first introduced in Australia in 1985, was the insistence that all students have access to the necessary Information Communications Technology (ICT) to regularly connect to CSU. These days, students can easily communicate with CSU and the teaching faculty through the Internet, email and various other ICT tools such as discussion forums that have been provided. The electronic communication has obvious advantages over the conventional mail, the facsimile and the phone. In addition to the University homepage, an online subject homepage with a teaching forum is organized for each of the subjects. Teachers can place announcements, news, comments related to the subject as well as

provide assessment feedback through the subject homepage. They can take part in discussions with the students and answer their questions in the teaching forum. Every student, no matter where they live, can access the information and participate in the discussion. Students now have an efficient channel to interact with their fellow students which was difficult, if not impossible, to have in the past. Within cyberspace, it does not make much difference whether students are in Hong Kong or in Australia.

FACE-TO-FACE MEETINGS

In Hong Kong, the program is operated in an enhanced mode. Two of the subjects are taught entirely by face-to-face teaching. We believe that for certain skills and practically oriented subjects, face-to-face lectures and workshops are often more efficient than distance learning. For the other distance learning subjects, students receive face-to-face tutorial support of around 16 hours per subject. When students can read announcements posted by the CSU academic staff, communicate with them using email, and participate in the teaching forum discussions, why do we still organize tutorial meetings?

Of course, there are many constraints and overheads in attending face-to-face meetings, such as scheduling the time and travelling to the meeting place. Distance learning is supposed to eliminate these problems. There is also some doubt whether these meetings are cost effective and whether such arrangements deter independent learning that is required in distance education. The same can be said of many face-to-face teaching strategies.

In Hong Kong, the overhead in travelling for attending meetings is far less a concern than in Australia. There is however, the added problem of learning content written in English when this is not the native language of the learner. We believe that local tutors are able to elaborate on the distance learning study materials and make it easier for the students to interpret the knowledge and apply it to their actual working environment within their local context. Wherever appropriate and necessary, study materials can be enhanced and supplemented with lectures such as the handling of information in Chinese.

The tutorial meetings also provide an opportunity for the students to have peer discussion on their learning outcomes and difficulties. The sharing of working and study experiences among themselves is also a valuable part of the learning process. The psychological and mutual support generated by the peer group cannot be neglected. Hong Kong is rather famous in its fast pace and busy working environment. It is quite easy for the students to fall behind the study schedule if they are studying alone. It does not mean that they are not capable of studying independently, but it is very difficult for them to maintain a regular study schedule when faced with all sorts of pressures for time. The scheduled tutorial meetings provide students with an effective mechanism to set checkpoints and to regulate the study plan.

We have sought the views of the students by conducting a questionnaire survey in March 2000. A majority of the students responded that they preferred the combined distance learning and face-to-face delivery mode over the purely distance learning or the purely face-to-face teaching mode. The result indicates that a compromise between the two pure forms of teaching modes gives students the benefits of both worlds. This point is elaborated upon below.

OTHER ACADEMIC SUPPORT

Through SPACE, students have access to the libraries and computer facilities of the University of

Hong Kong. SPACE has well equipped classrooms and computer laboratories in a number of conveniently located learning centres. When the students have study or personal problems, it is easier for them to get assistance from the local tutors and administrators that they are more familiar with. This provides convenient access to solve many of the simple problems, quickly and efficiently.

TEACHING MODES

Distance education is increasingly being seen as a more economic education delivery proposition. But market acceptance and resistance is yet to be tested and may not necessarily be the same over all subjects and in all courses. Cultural factors must also play an important part (Robinson 1998). The Asian students are perceived to be reluctant to become active learners. Can the increasing use of technology in course delivery, in communication between teacher and student, alter the traditional role of the teacher and student in Asia?

In countries like Australia, given the choice between attending face-to-face classes and studying at home, many students choose the latter. Can this experience be transferred into the Asian context? From the following comment by Cheng (1998), regarding students in Asian culture, it is uncertain whether Hong Kong students prefer to study at home and communicate electronically with their teachers.

Students in Asian culture are also not used to expressing themselves and exchanging views. They are more used to listening, keeping analyses in their minds, and express themselves only when it is very necessary. As such it remains to be seen whether the extension of the physical classroom to the cyberspace would further discourage or encourage interaction among students. (p. 8)

In our questionnaire survey carried out in March 2000 with the graduate diploma students, we asked them to select which teaching mode they preferred most. Two thirds out of the twenty one respondents prefer the existing arrangement, that is, some face-to-face taught subjects and some distance learning subjects with supporting tutorials. For the other respondents, five (24%) preferred all the subjects to be this hybrid of distance learning with tutorials. Two (9%) preferred face-to-face teaching for all the subjects. No one preferred the pure distance learning mode. This finding is encouraging support of our belief that the combined delivery provides Hong Kong students with the benefits of both worlds.

The distance learning has certain economies and conveniences. It also comes from an overseas university that delivers academic quality. By teaching a small number of subjects in face-to-face mode and providing tutorials in others, gives students personal contact with the teachers and fellow students. The academic and psychological support is valuable to their learning process. Perhaps we should not move too quickly towards a situation of less personalized teaching or total reliance on electronic access where the teachers and students increasingly become remote and impersonal, unknown to each other.

STUDENT BENEFITS

It could not be a complete success if the joint venture does not benefit the students. There is no doubt that the students are attending a course they need, otherwise they simply would not enroll. While they study for an Australian degree accredited by the relevant professional body without leaving Hong

Kong, they have enhanced, instead of restricted, support when compared with the fellow students in Australia. The overall tuition fee and the related expenses for studying in Hong Kong is much less than studying aboard in Australia as there is no boarding and travelling expenses. Since students can continue with their existing employment, the saving in opportunity cost is quite significant. Through the collaboration of the overseas and local institutions, the tuition fee for the enhanced combined delivery is comparable to the fee of pure distance learning.

But do the students find the course of high quality? Do they have problems in taking a distance education course offered by an overseas University? From the questionnaire survey, it was found that the students are satisfied with the distance education study packages, the assessment, the tutorial support, and the face-to-face teaching. In the written comment section of the questionnaire, the most mentioned issue was a simple logistical one, the need to organize the meeting venue at a conveniently accessible place. Some mentioned that even for the face-to-face subjects, a detailed study guide such as in the distance materials should also be provided. The fact that the distance learning subjects are offered by CSU at a distance does not appear to be a problem at all.

CONCLUSION

We have seen the delivery of a distance education course from an Australian university in Hong Kong in collaboration with a continuing education unit of a local university. The trend towards globalization happens in education as in other business areas. The computing and telecommunication technologies narrow the gap between the distance education provider and students, making distance education more effective. Nevertheless, some personalized contact between the teachers and students and among the students is still valuable and should be maintained. This is especially appropriate for places like Hong Kong, taking into consideration its geographic convenience and the cultural background of the students.

The overseas and local partners complement each other and provide an enhanced, combined delivery course in a cost-effective manner. Students enjoy the benefits of both distance education and face-to-face teaching. They do not need to go abroad but are able study for an Australian University award. At the same time, they received valuable teaching and tutorial support.

This example reflects the dynamic, flexible, and cost effective nature of developing continuing and professional education. The findings of this case study provide a useful reference for distance education providers to enhance their competitiveness when proposing to operate in other countries. On the other hand, it also reveals how a place can meet education and training needs through cooperation with overseas institutions. The key factor to its success is through international collaboration. The synergistic effect of the collaboration creates a win-win situation for the two institutions and the students. It is believed that the quality and effectiveness of distance education can be improved. The students, of course, become the primary beneficiaries.

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AN EVALUATION OF A MODEL MULTIPLE SITE DISTANCE LEARNING PROGRAM FOR NON-TRADITIONAL STUDENTS

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Index: Human Resource Development, Distance Learning

Abstract: The purpose of the evaluation was to determine student's perception of the effectiveness of a multiple site distance education program. Part 1 evaluated the distance education process. Students reported a positive experience with distance education. Many were apprehensive at first but after a class or 2, most began to like the process and preferred it to traditional classes. Part 2 evaluated program incentives & barriers, class structure and application of course content. Students responded that evening and weekend scheduling was the greatest incentive to participation in the program while lack of access to the advisor/instructor was the greatest barrier.

INTRODUCTION

Many working adults without a baccalaureate degree are denied access to responsible workplace positions and frequently have limited opportunities for career advancement. These limitations are especially significant for adults working in remote or rural areas. These workers face issues such as lack of availability of higher education, many family obligations, and constraints of time and finances. These keep them trapped in their current occupational situation.

To provide opportunities for working adults, a degree program was developed in the department of vocational and adult education at the University of Arkansas. Graduates earn a Bachelor's of Science in Education in vocational education with a Human Resource Development (HRD) concentration. It is available only to adults who are working full time, have worked at least 5 years and have 40 to 60 college credits which are transferable to the University of Arkansas.

The program has 125 credit hours of class requirement. Fifty-six credits are general studies such as English, science, social studies, fine arts/humanities, math, health/ wellness, and media/computers. Thirty-three credits of technical requirements include coursework in a specialty area. Students have a choice of transferring business or HRD coursework, testing out of requirement through the National Occupational Competency Testing Institute (NOCTI) and receiving credit for work experience or industry training through the development of a portfolio based on guidelines developed by the Council for Adult and Experiential Learning, the American Council on Education and the National Program on Non-Collegiate Sponsored Instruction.

Thirty-six credits of HRD coursework are required in the degree program. The following courses are required as part of the 2-year cohort plan.

- Skills and strategies in HRD
- Theory and principles in needs assessment/evaluation

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- Communications in HRD
- Strategic design of HRD
- Theory and principles in adult education
- Theory and principles in team building
- Strategies in professional development
- Leadership in HRD.

A 12 credit work-based project/internship is also required. The internship is a work related project built around the HRD coursework.

The degree program, which began in the fall of 1996, was structured as a partnership between the University of Arkansas and community colleges throughout the state. The students completed their general studies and many of their technical requirements at the local community college. After students finished most of their general studies, they began the University of Arkansas cohort component of the program by interactive audio/video. The human resource content courses were offered in an accelerated format meeting 9 weeks rather than the standard 15 weeks and meeting on weekends to accommodate working adults. Each course was offered at 1 host site and 3 or 4 remote sites. There were a total of 10 sites throughout the state of Arkansas with a current enrollment of 175 students. The students enrolled in this program were non-traditional students ranging in age from 25 years to 60 years.

PURPOSE

The purpose of this study was to determine student's perceptions of the effectiveness of a multiple site distance education program, which leads students to a Bachelor of Science degree with an emphasis in human resource development. Part 1 evaluated the distance education (interactive audio/video) process. It consisted of equipment use, interaction between sites, and instruction by distance education vs. regular classroom. Part 2 evaluated program barriers, incentives, and class scheduling.

Methodology

Ninety students participated in this study over a 2-year period. Data for Part 1 was collected with 6 open-ended questions. Each question asked for general feelings/attitudes about an aspect of the process. Thirty-five students who had completed 4 distance education courses responded to the questionnaire. Data for Part 2 was collected from 55 students randomly assigned to ten focus groups. All ten groups addressed 9 open-ended questions. Participants in this part of the study had completed 2 distance education courses.

Data Analysis

Content analysis was used to analyze the responses. Content analysis is an objective and systematic technique to describe the content of any form of communications. In education, content analysis is aimed at producing descriptive information by answering questions directly related to the material analyzed and identifying educational problems (Borg & Gall, 1989). Entries were analyzed by documenting key words and phrases in the text. Two researchers read the entries independently and then compared results.

Frequencies of responses to each item were compiled.

FINDINGS

Part One

Item 1 asked participants to comment on their perceptions of the use of the equipment in distance education. Results in rank order from high to low were rough beginning but then things worked well; equipment worked well, liked the use of technology; would like to see more use of video and other equipment; and the instructor was good with the equipment.

Item 2 asked learners to comment on their perceptions of the interaction with other students at other sites. Comments ranked from high to low were good to excellent interaction; were skeptical, but after a couple of classes warmed up to the type of class; liked group meeting in which all site students could meet each other; had a problem with class at beginning but became more comfortable with other sites as time went on, and instructor did well in including all students from each site.

Item 3 asked for perceptions of the effectiveness of instruction with the use of distance education verses regular classroom instruction. Results from highest to lowest were liked distance education classes better than traditional classes even if there were a few technical problems from time to time; distance classes were not much different from traditional classes; the instructor was the main factor in the success of the distance learning class; and technical problems made communicating more difficult and the use of the equipment made lecture difficult to follow.

Item 4 asked for learner suggestions for changes for distance education classes. Comments ranked from highest to lowest were most responded there was no need to change anything; would like more group time and less use of overhead transparencies; less lecturing; updated equipment such as better microphones; and more breaks.

Item 5 asked for learner perceptions of class components to leave the same. From highest to lowest comments were like to keep the instructors the same (not switch to new instructors for the next class); learning environment; class schedule; interaction between students from site to site; discussions; and demonstrations.

Item 6 asked for general comments regarding the use of distance education. The most common comment was that they liked the way the instructor related to them and included them in the class participation. Other comments included were liked the schedule (9 weeks of class rather than the standard 15 week semester) and were grateful to earn a degree without a commute to the home campus.

DISCUSSION

Part One

Overall students reported a positive experience with their distance education program. Many of the students encountered difficulties in the beginning of the class with use of the equipment. Some students reported difficulty interacting with students at other sites but became more comfortable as the course progressed. Students preferred the distance-learning mode of instruction when compared to instruction by traditional learning.

FINDINGS

Part Two

Data for Part 2 were analyzed by recording the written comments from the open-ended questions. The first question was "What incentives were there for you to enter the program?" The majority of the responses (66%) indicated that scheduling was the major reason for participation in the program. This included comments such as time of day and day of week courses were offered; location of classes, convenience of classes, and flexibility of program. This was followed by 13% who indicated that they received tuition reimbursement from their employers. Next, 10 % of the responses indicated that the reason for being in the program was for personal growth and the chance for pay raises or increasing their marketability. Also 10% of the respondents liked the program component that allowed them to earn college credit for work experience.

Question 2 "What barriers did you experience with the program?" revealed the following responses: First was lack of contact or accessibility of on-campus advisors/instructors (57%). Included in this category were items such as lack of understanding of overall program, transfer credit problems, lack of understanding of assignments, inability to receive class feedback and lack of updated advising information. The second item identified as a barrier was cost of the program (24%). The last was 19% were miscellaneous comments such as travel, time, lack of access to computers and student disruption in class.

Question 3 was "To what extent did the topic of Human Resource Development affect your decision to enter the program?" Sixty percent indicated a strong interest in Human Resource Development while 40% were just in the program to get a degree.

Question 4 was "How did the Friday/Saturday scheduling affect your decision to enter the program?" Ninety percent indicated that the scheduling was positive. Comments were made such as: "this is the major reason I am in the program" and "the scheduling is very convenient." Ten percent indicated that the scheduling made no difference in their decision to participate in the program.

Question 5 was "How did the number of class meetings affect your decision to enter the program?" One hundred percent of the responses were positive. Comments included "wonderful," "great" and "very convenient."

Question 6 was "How have you benefited professionally from this program?" Sixty nine percent of the responses were positive with comments like "knowledge learned has been applied" and "we have formed networks." Thirty one percent of the responses indicated that they had no opportunity to apply new knowledge learned in the classes.

Question 7 was "What factor of distance education has been the most positive experience for you?" Fifty six percent of the responses indicated that class interaction was the best part of distance education. The most frequent comment was learning from others in class. Forty four percent indicated that the location of the class in their area of the state was the best part of the program. Comments were "less travel time," "chance of earning a degree from the university without coming to class on the home campus" and "good schedule time."

Question 8 was "What factor of distance education has been the most negative experience for you?" Forty six percent indicated that the use of the distance education equipment was the most negative part of the program. Comments included "needed updated equipment," "delay of transmission on equipment effected class" and "there was a need for training on the use of the equipment." Thirty six percent indicated that the lack of an instructor on site was the most negative

part of the program. Eighteen percent said that the class was too large for good class participation due to the number of distance education sites.

Question 9 was "What do you perceive as the major significant difference between regular classes and distance education classes?" Sixty six percent indicated that the major difference was they were treated like adults in distance education classes. Seventeen percent indicated that access to class instructor was a different. Also, 17 percent said that the convenience of scheduling was different.

DISCUSSION

Part Two

Students reported that they entered the program because of location, weekend class schedule, accelerated course of study, and professional benefits (salary enhancement, networking, job advancement). Less travel time and group participation provided positive experiences for the students. The greatest barriers reported were accessibility of on-campus advisors/instructors, inaccessibility to computers and financial constraints. Some students reported problems with the delay in compressed video time and lack of an instructor at the remote site.

CONCLUSIONS

Since the program was implemented, approximately 40 students have entered each year. Ninety-five percent of the students completed the HRD cohort courses by distance education. The high retention rate indicates satisfaction with the program. Approximately 30 percent of the students have completed all graduation requirements. Overall, students reported the distance learning experience as being more relaxed than traditional classes.

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HOW TO TEACH STUDENTS IN THE INFORMATION ERA?

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Index: Problem-based Learning. Student-centered teaching

Abstract: Problem-based learning (PBL) is a way to help students to think and make use of suitable information to solve their problem. However, direct import of the typical PBL model may not be appropriate to local student. This study focuses on the advantages and disadvantages of previous PBL model used and studying the effect of modified PBL model in a Higher Diploma engineering course in the HKIVE(TY). This modified PBL model uses a variety of teaching and learning modes to facilitate students to solve the real world cases. Promising results gathered from summative test and student interview show that this local context PBL model is suitable to all students.

INTRODUCTION

In the past, people were badly lack of information to support their learning and working. Nowadays, we experience too much information through different media especially through Internet. Usually, we can obtain a lot of related materials through search engine from Internet. Then, another problems will be arised when we are facing such huge amount of information. How can we select suitable information to read in so limited amount of time? How can we digest the information? How can we make use of the information to solve our problem?

On the other hand, Students in Hong Kong are familiar and comfortable with didactic teacher-centered approaches. Some methods should be used to channel tertiary students out of the didactic teaching/learning model commonly found in secondary schools. One of the most effective ways for preparing independent life-long learners is when it is problem-based (Boud, 1985). Problem-based learning is one of the methods to improve the quality of student learning (Gibbs, 1992). PBL was found to maximize learning outcomes (Lai & Chu, 1997). There have been many studies of the effectiveness of PBL in increasing knowledge retention and fostering deep learning (Schmidt, 1989; Tans, 1986; Boshuizen, 1990). PBL is also known to enhance abilities of students to integrate basic science knowledge into the solutions of clinical problems (Patel, 1991). With regard to effective outcomes, PBL enhances intrinsic interest in subject matter. Barrows and Tamblyn (1980) advocates that this student-centered approach increases motivation because students are given chances to generate learning issues and thus have ownership to their own learning.

The philosophy of problem-based learning (PBL) is that deep understanding and learning can come only from active processing of new information. Problem-based learning, perfectly in keeping with contemporary constructivist views of education, is an instructional method that uses real world cases or problems as vehicles for students to acquire critical thinking and problem-solving skills (Lai & Chu, 1997; Chu & Lai, 1997). Original form of Problem-based learning (PBL) was created in Western countries and first used to teach medical students to find possible solution through real life cases. PBL is one of the student-centered teaching approaches that are proved to be effective to foster deep learning and improving problem solving skill. Traditionally, PBL works well in small classes and this method emphasizes on the learning process in which students actively engage in collecting information and solving a problem. Students are not working alone as they can build their

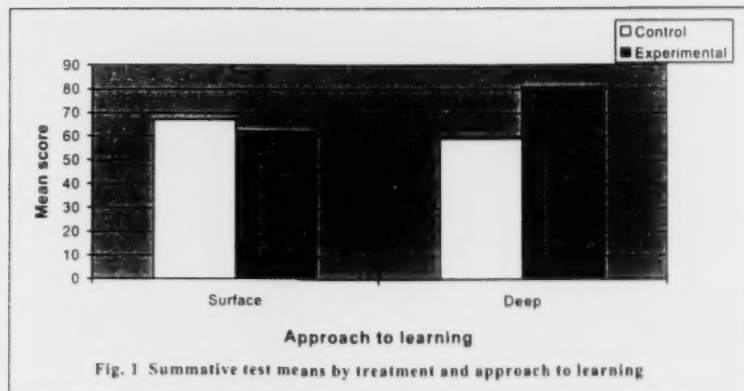
own understanding under the guidance of instructor, but the instructor does not do the building for them.

There is growing number of research on the implementation of PBL in Hong Kong for different disciplines such as education (Biggs & Tang, 1997), engineering (Lai & Chu, 1997), and hotel & management (Tse, 1997). Although PBL is used by teachers in many different teaching and learning contexts, successful implementation of PBL may not involve direct transportation of the original form of PBL. Almost all local PBL models (Biggs & Tang, 1997; Lai & Chu, 1997; Tse, 1997) used were specifically designed to suit the individual teaching or learning context. Tang et al, in their study of PBL within the Hong Kong Polytechnic University, pointed out that consideration should be given to the actual teaching and learning context (Tang et al, 1997). There is a growing need to develop a context-based model which would preserve the philosophy and retain the key elements of PBL but allowed for modification and adaptation in response to each local teaching and learning context.

ORIGINAL FORM OF PBL

Original form of PBL was introduced in the then Hong Kong Technical College (Tsing Yi) two years before (Lai & Chu, 1997). The students discussed the case or problem as a group, clarifying terms and concepts not readily understood by making use of knowledge of the group members. Based upon their common consensus, the group then proceeds to generate hypotheses necessary to analyze the problem. Then they begin to define 'learning issues', which are more or less what they do not know and need to find out in order to solve the case. These learning issues serve as guide for studying the literature or searching for other sources. Learning resources are considered, and here the instructor and students decide on where they can find the relevant information. At the next session, students inform each other about their findings, and teach the rest of the class what they have learned about their assigned issue. Attempts are made to integrate the new information, and to relate it to previous knowledge. If the learning process raises new questions or leaves some issues still poorly understood, these too are listed and the cycle is repeated until a satisfactory evaluation and clarification of the case can be made. This second meeting aims at checking whether a deeper understanding of the problem has been reached. In all these processes the instructor attempts not to inform but to guide, support and encourage the students' initiatives.

The two Engineering classes used in this previous study was taught by the same teacher, with the Experimental (PBL) class (N=41) taught in the problem-based way, and the Control class (N=21) taught in the usual expository way. The final summative test consisted of questions testing the higher-order cognitive abilities. Results (Fig. 1) show that experimental students with a bias towards a deep approach to learning achieving considerably better than the deep-biased students in the control class ($t=2.20$, $p<0.05$). However, for surface biased students, the average test scores of both experimental and control classes are quite similar.



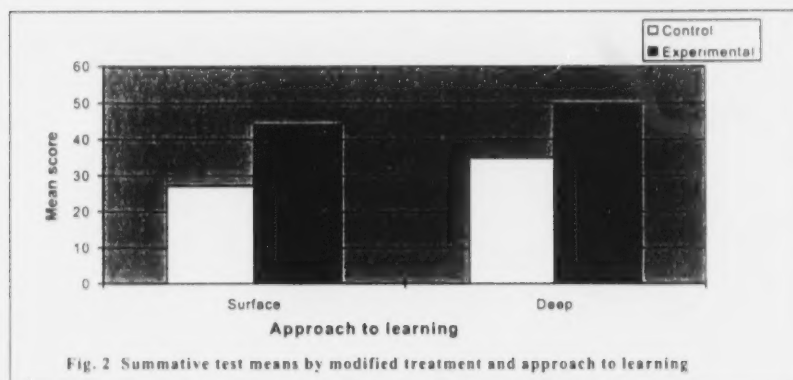
The interviews clarified how this worked. Deep and surface students perceived the impact of problem-based learning teaching strategy for different assessment tasks in quite different ways. Deep learners liked problem-based learning for it can enhance understanding of the subject matter by individual and group work, hence, enable them to answer questions easily. Quite a different response emerged from the surface learners when they had gone through the assessment tasks. The surface learners expressed their preference for low-order skill questions. Deep and surface learners also differed in the ways they studied for the test in this study. Most deep learners spent only a short period of time to prepare for the test because they found they had already understood the materials after undergoing the problem-based learning process. Surface learners, on the other hand, had to spend more time to study before the test. They found it a lot more difficult than the deep learners to prepare for the test because they, without any lecture notes to study, could not understand the materials.

MODIFIED FORM OF PBL

The subjects are year one engineering students studying in the Hong Kong Institution of Vocational Education (Tsing Yi). A subject is randomly chosen for two engineering classes. These two large classes, with 74 students each, have the same entry qualification. The modified PBL model is designed to suit the course requirements and standards set by external engineering professional bodies. The modified PBL model uses a variety of teaching and learning modes which include lectures, tutorials, group discussion, and presentation to facilitate students to solve a main problem. For the experimental class, 4 students form a group. Members of each group are the same throughout this period of study (approximately 15 weeks) and all activities are group based. Students can tutor each other and solve problems collaboratively in the lecture as well as the tutorial.

A summative test is given to both experimental and control classes at the end of this study. The questions of this summative test are related to basic knowledge given in the mass lecture as well as the project work. Based on the numerical result of this test, learning outcomes between these two classes in this PBL program can be studied. This final summative test also consists of questions assessing the higher-order cognitive abilities. At the end of the study, eight students from the experimental group are randomly selected and interviewed. The aim of this interview is to probe in an open-end way how this modified PBL model may affect their learning and their views towards this new teaching approach. The interview is conducted in Cantonese and is audiotaped. Results (Fig. 2) show that the experimental class was superior to the control class in the test score, students with

both deep and surface biased approach to learning achieving considerably better than the control class.



It shows much difference for questions assessing students' higher-order cognitive abilities. The t-test for the average scores yields $t=2.837$ (surface) and $t=2.577$ (deep). In both cases, $p<0.05$, establishing a statistically significant of improvement of students' problem-solving skill in the experimental classes.

Positive feedback also obtained from student interview. Most students from experimental classes enjoyed the chance to discuss together during the completion process of the main problem. Actually, students could teach each other and remember the discussion process for a longer period of time. They were encouraged to work harder by peer pressure within a group. After the discussion in this exercise, students could be trained to think and learn independently. Even a surface student, who was not so active in the discussion, could learn difficult concept through the discussion process.

Supporting sessions such as lecture and tutorial were also essential to the success of this modified PBL model. These two teaching activities provided an environment for students to learn basic concept rather than start everything from zero by students' own effort. Problems given in the lecture and tutorial helped student think actively and understand the topic more so that they could eventually apply the theory to practical design with this PBL model.

Positive changes in learning style were found among students in the experimental class. Deep students had reported better time management and deeper thinking. Surface students had confidence to ask more questions and learned to transfer knowledge into practice.

CONCLUSION

As suggested by Tang et al, (1997), a direct importation of the typical model of problem-based learning is inappropriate. This can be reflected from the student interview that some students cannot solve problems by their own in the beginning. They would like to have some guidance of project work to lead them to acquire problem-solving skills. The quantitative results support the previous findings (Lai & Chu, 1997; Glasgow, 1997; Hadgraft, 1998) that problem based learning increases the problem solving skill of the students in the class. Positive changes were reported by deep students in the interview. In contrast with Lai & Chu (1997), the present study also shows an increase in the problem solving skills of surface bias students who are usually labeled as role learners and adopt passive learning approach (Griffith, 1992).

This hybrid PBL model provides an environment for students to actively solve real life case problems through the support of interactive lecture, quiz, and tutorial to learn basic concept and problem solving skills. Though the discussion process, students had different viewpoint to be expressed. Students can learn from different ideas generated to solve the same problem. This also creates more interest for students in learning. Both deep and surface students are encouraged to think and benefit from this active learning process.

This study concentrates on the full time engineering student. It is also worthwhile to study on the application of this hybrid PBL model to part time students or students of other non-engineering courses to find out any constraint that will be encountered. Finally, in order to improve cooperation between students within a group, it is better to introduce more elements such as cooperative learning into the process so as to help students better throughout the problem solving process.

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INTEGRATING ADULT LEARNING PRINCIPLES IN WEB BASED OPEN LEARNING

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Index: Open & Flexible learning, Adult learning, Web Based Instruction, Life Long Learning,

Abstract: It is evident that one of the driving forces towards a learning society resides in the role and power of information and communication technology. While the power and potential of technology is clear, the challenges lie in using technology wisely to advance the lifelong skills. The educational arena of web based learning is still in its infancy. While there are many institutions that are offering web based courses for adult learners, an in-depth understanding of the pedagogical issues related to integrating adult learning in web still remains an unexplored frontier. While literature provides some evidence of the effectiveness of using web based open learning, little is known about which learning strategies should be used to integrate adult learning principle in web to make it useful, interesting and exciting.

INTRODUCTION

A number of underlying social, economic, and technological forces are coming together to escalate the demand for lifelong learning and training. The present era demands retraining of workers at least five times in their working life. Changes in technology demands new ways of working, new business processes and new ways of delivering education. One of the options to meet the demand for life long learning while providing a range of open & flexible choices is online education. During the past few years, the world witnessed a phenomenal growth in communication technology, computer network and information technology. With the development of new broadband communication services, convergence of telecommunication with computers, recent developments in the field of communication protocol (Internet & WWW) have fostered numerous proposals for the uses of these tools for open & flexible learning (OFL). The technology evolution from distributed to interactive, and then to collaborative has offered unprecedented opportunities to implement enhanced form of open and flexible learning (OFL), anytime & anywhere in collaborative environment. OFL has played a significant role in the transformation of universities to places of lifelong learning. Information technologies are playing a key role in this expansion. However, the use of information technology does not necessarily equate with open & flexible learning, and it is a common misconception to confuse technology as being the end product rather than means of delivery.

Developing a web based open learning material requires more than an understanding of hard technology i.e. bit & bytes, electronics & satellites, CGI, search engine or HTML. What we need to understand is the soft aspect of the technology that provides a conceptual framework to develop courses in web for life long learning. Designing effective web based training requires knowledge of the unique characteristics of adult learners and understanding of the facilitator's role. It is easy to lose sight of the importance of the principles of adult education when caught up in the necessary tools and technology inherent in web. Present paper discusses the different dimensions of adult

learning and highlights the importance of integrating adult learning principle in web based open learning to make it relevant, useful and exciting.

OPEN LEARNING AND WEB

Open learning is the term internationally accepted to apply to learning where learners have some choices as to what and when and where and how the learning takes place. Open learning is not a specific mode or way of delivering education, it is a philosophy about how education can be delivered in an open way. It is primarily a goal or an educational policy. The provision of learning in a flexible manner, built around the geographical, social and time constraints of individual learners, rather than those an educational institution. Bates (1995). Open learning philosophy focuses upon two major ideals:

The access ideals: Where access refers to the reduction or elimination of any thing that stands between the prospective learners and the learning environment, it may be time, place or others

The learner centered ideal: Where learner centered ideal refers to the provision of learning opportunities to the individual learners by providing control over the pace and style of their learning. It enables learners to have greater independence and control over the learning process.

Open learning approaches in education and training offer increased opportunities for people to learn over lifetime. One way of explaining the philosophy of open learning is the extent to which flexibility of options and choices (content, place, time, and pace of study) are provided for the learner. With the convergence of computer and communications technology through the World Wide Web, we now have the capacity to offer enhanced forms of flexibility. The capacity of the web to hyperlink and layer information, provide interactivity and support multimedia formats makes it a valuable and exciting tool which can used to develop, deliver and manage flexible learning programs at any time and anywhere. At its simplest the Web can be used to co-ordinate and manage learning and act as a point of communication for staff and students. At its most sophisticated it can be an online or offline virtual learning environment that facilitates the entire educational process. Information technology has made it possible to implement OFL program at its fullest extent. However, the use of information technology does not necessarily equate with open & flexible learning, and it is a common misconception to confuse technology as being the end product rather than means of delivery. Designing effective web based OFL materials for life long learners requires to know about adult learners particularly their characteristics, context and needs. This will help to shape the materials in complexity, amount, details, breadth and relationship.

ADULT LEARNERS ARE VARIED

The term adult learners represent a wide spectrum of mature learners. This includes but not limited to single mothers, middle aged man seeking a change in career, women returning to the workforce after having spent years caring for their children and families, persons who did not have the opportunity to attend college between the ages of 18 to 22 due to financial limitations, but also worker at large need training for change in technology. In as much as each of these learners has different circumstances associated with becoming an adult learner, they do share a common set of needs and expectations from the educational experience and environment. It is now becoming

imperative to understand the unique characteristics of adult learners to design effective and appropriate web based on-line courses.

ADULT LEARNERS ARE UNIQUE

Adult learners are people who come to us with their unique backgrounds, personal experiences, conceptual understanding and approaches to learning under personal circumstances. Authors such as Knowles (1998), Brookfield (1990), has described the special characteristics of adult learners. Adult learners bring a wealth of real-life experience to training that can be a resource for learning and they are motivated to learn as a response to problems in their lives. They prefer to learn at their own pace, own time, and own place and often around fellow learners. They like to manage and control of their own learning. . So adult learners prefer to have

- ❖ Problem-based learning
- ❖ Real-life experience
- ❖ Active learning
- ❖ Varied learning styles
- ❖ Meaningful learning
- ❖ Action oriented learning
- ❖ Self directed learning
- ❖ Autonomous learning

PROGRAM DESIGN AND WEB

The primary epistemology, which guided the design and development of the web course for adult learners, is constructivism. According to the constructivist, learners construct different cognitive structures based upon their previous knowledge and what they experience in different learning verses.

It is believed that constructing knowledge requires teaching and learning strategies and an environment, which present learners with knowledge building structures. There are three distinct viewpoints of the constructivist epistemology: a personalistic view, the social point of view and academic modes of knowing . Each of these views provides important frameworks, Merickel (1997), for the design and development of on-line courses. The personalistic view focuses on the students and their interaction. It focuses on the individual personality within the context and assist individuals in understanding themselves and their relationship to the world. The social point of view centers on the students constructing knowledge together. This framework establishes that knowledge building is based on the social processes provided by the context. The academic modes of knowing, also known as the academic inquiry view, centers on the academic disciplines. This view poses that the function of schooling is to provide students with the academic tool set to assist them with constructing knowledge. Information processing theory provided a good framework for the use of academic tool set. In constructivism, learning is seen as a constructive process in which learners have an active role and learning is based on their cognitive functioning. The learners obtain new knowledge by constructing it on the basis of their earlier knowledge, upon their active functioning in continuos interaction with the surrounding reality, and from other learners.

Developing problem-solving and critical thinking skills are essential components for adult learning. PBL is a critical –thinking process whereby learners utilize systematic approach in isolating root causes of problems, which lead to corrective action. Researchers such as Davis (1992) and Perkins (1986) have championed instructional techniques that address student's divergent or creative thinking. WWW has provided a large array of tools and environment to implement instructional techniques that address the students divergent or creative thinking. Web browsing software now exist to explore and search, find pattern and relationship, rank ideas, view results and send findings to peers and instructor. Apparently, the Web is an ideal tool to nurture the students willingness to take risks, commitment to task, curiosity, openness to experience, broad interest, originality, imaginative play, intuition, attraction to novelty, artistic ability, metaphorical thinking, problem finding, elaboration of ideas and breaking away from the norm - all of which are attributes of creative people, Davis (1992), Young (1985). The anonymity of pen names and pseudo roles during electronic discussions encourages student idea experimentation and risk taking disclosure, Harasim et al. (1995). Some of the suggested techniques for web to enhance creativity in electronic environment are:

- Brain storming & Reverse brain storming : Focus on Idea generation
- Assigning thinking roles : Anyone in the roundtable is assigned a role
- Creative writings: One starts writing, another expands the idea.
- Just suppose you are education minister- what will be your priority?
- Idea-spurring questions: Suggestions to modify & improve.
- Semantic webbing: Give a word in the middle of semantic map, suggest attributes related to the concept.
- Simulation & Role-play: Role playing in simulated environment.

It has been observed that discussion and interaction under asynchronous conferencing in different time & different place tend to be more extended and engaging for the learners than traditional environment. Learners can reflect their opinion in much relaxed way and their own convenient time, which creates a congenial environment for creative reflection.

CRITICAL THINKING ON THE WEB

Critical thinking is reasonable, reflective thinking that focuses on deciding what to believe or do. Learners learn to look at a concept or phenomena aware of their own biases and approach the situation objectively and logically. Creative thinking on the other hand is the ability to form new combination of ideas to fulfill a need or to understand a specific natural occurrence. Despite extensive divergent thinking avenues, enhancing critical thinking pathways may be an equally strong dimension of the web. Some of the emergent ideas on critical thinking in web are:

- Graphic Organizer: Emphasizing on spatial representation like model, Venn diagram etc. It facilitates critical thinking by helping learner to sort out the hierarchy and logical flow of ideas.
- Ranking Methods: To rank and categorize brainstorming ideas in web.
- Reflection: Writing, to think, activities for reflection and critical evaluation.
- Mock trial & debate: Encourage to come-up with arguments.
- Case-Based Reasoning: Case study and comments

Any activity which encompasses search for cause and effect, find pattern and relationships, rank ideas, develop timeliness, build taxonomies is a worthwhile exercise of critical thought, Bonk & Reynolds (1997). In web, there are plenty of opportunities to enhance cause and effect relationship by using simulation and animation program in Web/ CBT packages.

Apart from implementing critical and creative thinking on web, there is a need to involve learners in planing and evaluating. Adult learners should be empowered to become self-directed learners, to define program goals, create exercises, and evaluate their own progress. Web-based training is well suited for collaboration between learners and the instructor because there is ample opportunity to communicate synchronously and asynchronously using various web tools. There is always need to design learning experiences that require adult learners to become actively involved. Graphics, videos, images, hypertext, and audio help adult learners understand concepts more easily than conventional text based presentations. Multimedia provides learners with alternative ways to examine problems and learn new skills. Adult learners like. environment in which learners are valued as individuals and feel comfortable participating. It is imperative to design online forums, exercises, and feedback loops with the above perspectives . The principal design consideration for developing online courses involves learning by doing, learning to learn, learning to digest and learning to feedback philosophy.

Adult learners need encouragement to explore new ideas and alternative ways of solving problems, critical reflection and group exercises. They always want to assume responsibility for their own learning which is the core of autonomous learning.

COLLABORATIVE LEARNING ON THE WEB

Earlier generations of distance learning media and methods were ill suited to the active learning model and had a bias towards straightforward teaching. More recent initiative on on-line learning can create the potential for new forms of collaborative learning through technology. It has spawned on-line learning which are based on a collaborative learning instructional paradigm rather than the self-instructional model of multimedia authoring systems. As such, they make extensive use of the asynchronous and synchronous collaborative tools available in web.

But simply making an on-line conferencing available and asking learners to use it is not collaborative learning. The way a learner learns in on-line setting has not been extensively studied. Most current use of on-line education transfers traditional classroom instruction to on-line setting, recasting reading into web based materials, lectures into on-line lecture notes or video clips and discussion into on-line conferencing, Bourne et al. (1997). Which is basically nothing but Internet based correspondence courses, which rely on information acquisition and reflect low level learning. Are we utilizing the real strength of collaborative technology while designing on-line courses? As we reposition our course materials from traditional to web learning, the paramount concern should reside on the question as to how to develop the features of a collaborative learning environment in true sense.

Unlike the teacher-centered models that view the learner primarily as passive recipients of knowledge, collaborative learning is based upon a learning team-centered model that treats the learner as active participants. The conversation (verbalizing) multiple perspectives (cognitive restructuring) and arguments (conceptual conflicts resolutions) that arise in co-operative groups may explain why collaborative groups facilitate greater cognitive development than the same individuals achieve when working alone, Sharon (1980), Webb (1989).

CONCLUSIONS

Designing and developing effective on-line courses for adult learners require a new approach to various pedagogical dimensions of on-line environment. There is a paradigm shift in educational practice of teaching and learning in web. Where learning through facts, drill and practices, rules and procedures was more adaptive in earlier days, now learning through projects and problems, inquiry and design, discovery and invention, creativity and diversity, action and reflection is more fitting for the present times. So there is a need to develop a conceptual framework on the pedagogical dimensions of on-line learning based on collaborative learning strategies. So there is need of an urgent pedagogical shift, Majumdar (1999), from instructivist to constructivist, behavioral to cognitive, didactic to facilitative, controlled to autonomous, fixed to open, interactive to collaborative, rigid to flexible, passive to active, surface to deep, content to learning to learn, learner centered to learning team centered approach to meet the demand of the on-line adult learners of next millennium. If on-line courses are designed incorporating the desired changes in pedagogical dimensions, the difference between teaching and training on the web and traditional methods for adult learners can be profound.

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INTEGRATING THE STRENGTHS OF THE WEB-BASED AND TRADITIONAL MODELS OF TEACHING

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Abstract: The Internet has revolutionized the way we communicate and created new paradigms for innovation in education. This paper discusses the pedagogical issues conforming to constructivism that educators may consider in the delivery of instruction in post-secondary vocational education. The roles of both the students and teachers must be redefined in the new paradigm. An intellectually exciting learning experience can happen in a classroom, a laboratory or the cyberspace. The art of combining the strengths of classroom face-to-face teaching and Web-based self-directed instruction will be a challenge to educators. In addition to management support and a fair reward system as drivers for improvement, success in the integration of information technology in teaching will rely on teams of teachers who are committed to learning, experimenting, collaborating and sharing their knowledge.

INTRODUCTION

In the past few years, the implementation of Web-based teaching has grown dramatically. Pulled by the demands for lifelong education, many tertiary institutions have become global educational enterprises and distributed their learning programmes to anywhere a telephone line exists. Other institutions adopt Web-based teaching to supplement traditional classroom teaching under the threat that if they are not ready for this new technology, they may lose the best students. Many institutions have realized the need to fundamentally re-think the design and delivery of education for the community, in order to fulfill local community needs as well as the demands for lifelong learning in the global knowledge society.

This paper discusses the pedagogical issues conforming to constructivism that educators must consider if they are to maximize the benefits of Web-based technologies for teaching and learning. Researches indicate that a major reason for past failures of IT projects has been the lack of knowledge and skills of teachers in mastering the tools and integrating them into the curriculum. No matter what strategies or tools we use, the needs of the student must be in focus. We shall share what we have learnt from our Web-based teaching pilot project in which we were given a limited period of time and no additional funding.

THE CONSTRUCTIVIST VIEWS OF TEACHING AND LEARNING

Many scholars describe learning as "that reflective activity that enables the learner to draw upon previous experience to understand and evaluate the present, so as to shape future action and formulate new knowledge." Most education reform programmes in the 90s are rooted in the constructivist theory of learning (Riel and Becker, 2000). **Constructivism** emphasizes that learning is a process of active knowledge construction, not passive knowledge recording or absorption. Learners use current knowledge to construct new knowledge base from direct interaction with sources in the environment. Through social interaction, they actively create meaning out of their individual and group constructions of reality. Learning is context dependent, and highly tuned to the situation in which it takes place.

Reformers advocate a move away from traditional, teacher-centered, didactic instruction, where students are just passive receptors of knowledge, toward more student-centered and constructivist teaching that focuses on inquiry and experimentation. The new pedagogy redefines the classroom as a community of learners in which speakers, readers, and writers come together to define and redefine the meaning of the academic experience (Garcia, 1999). It also redefines the teacher's role as coach and facilitator of learning. The "learning by being told" model of instruction is believed to be not very useful for the active learner. The traditional and the constructivist approaches to teaching are compared in Table 1.

	Traditional Classroom Teaching	Constructivist Teaching
Educational Philosophy	Knowledge Transmission	Co-Construction of Knowledge
Role of Teacher	Delivers information in a structured coherent order	Coach, guide, Learning Community facilitator
Role of Learner	Passive reception of information	Share interests, learning and knowledge with others
Concept of Knowledge	Accumulation	Transformation
Teaching/ learning Process	Association, memorization, conditioning-rewards & punishments	Problem solving, inquiry argumentation, dialog and debate
Assessment Process	Tests of retention of information	Performance portfolios, projects

Table 1: The changing paradigm of classroom teaching. (Adopted from Riel and Becker, 2000 and the Report on Integration of Educational Technology into the Design of Schools for the Future in Queensland (June 1997)).

From a more practical perspective, Chickering and Gamson (1987) describe the essences of good teaching in terms of seven principles of good practice. These seven principles apply equally well to online instruction (Chickering and Ehrmann, 1998). They are given below:

1. Good practice encourages contacts between students and faculty.
2. Good practice develops reciprocity and cooperation among students.

3. Good practice uses active learning techniques.
4. Good practice gives prompt feedback.
5. Good practice emphasizes time on task.
6. Good practice communicates high expectations.
7. Good practice respects diverse talents and ways of learning.

CLASSROOM TEACHING

Classroom teachers who define instruction as the transmission of knowledge have students learn concepts and skills through listening, copying text, and practicing sets of similar problems. Classroom teachers who define instruction as the co-construction of knowledge focus on project activities that expect students to display understanding, interpretation, and original thought.

Riel and Becker (2000) examined the pedagogy of the Teacher Leaders in secondary schools in the United States revealed that the pedagogy of the Leaders was closely tied to the constructivist philosophy. Their classroom activities supported more cognitive challenges, encouraged project work that was extended through time, and encouraged students to work together and to share what they had learned with one another.

Face-to-face contact in and out of class meetings is an important factor in student motivation and involvement. This is particularly true for post-secondary vocational education of youths who enroll in their vocational courses as a second choice in tertiary education. In the absence of any face-to-face interaction, it would be difficult to inspire the unmotivated students so that they feel a desire to learn.

Active learning involves students in the classroom engaging in thinking and interacting with their peers. The teacher has a number of techniques at his/her disposal, such as questioning, discussion, small-group presentations, role plays and case studies.

WEB-BASED TEACHING

The online learning environment enables anytime and anywhere accessibility of teaching materials but technology cannot change the fact that a good course still requires a good teacher. It does not mean that a course will become better simply by putting the curriculum on the Web (Ricketts *et al.*, 2000). Teachers have to exploit the strengths of web technologies and new pedagogies that emerge with alternative ways of communication. For instance, using audio with video can promote engagement of multiple brain channels, resulting in higher retention. Graphical simulations can facilitate understanding of complex concepts. The teaching/learning materials must be functional in addition to accessible. Web-based instruction needs to follow good instructional design principles and conform to good teaching practices and sound Web design principles (Rice *et al.*, 1998).

A pedagogical model of learning by investigation was employed by Badcock *et al.* (1996) in their project of using the Web to teach fluid dynamics. Rather than simply presenting information, the course was designed to involve the students in the learning process by encouraging them to think about the subject. This was achieved via a question and answer system, which works in this manner: the student is given some information, then asked a question. The student should try to reason out an appropriate answer from a choice of three or four alternatives. The student is given feedback in the form of text with illustrations, video, or animation.

An example of applying constructivist approach in online teaching was described by Downing and Brown, (1997). Rather than simply using the World Wide Web for providing information, students are

asked to develop and review such material themselves in their course on Personality Psychology. Students are required to publish their work on the Web. An email list is used to facilitate discussion. After peer review, the material becomes part of an online course hypertext. The process encourages students to develop their understanding of the topics and gives them the satisfaction of knowing their work is seen and appreciated by a wide audience. Experiences show that students would produce work of higher quality if they know that their work will be viewed by a large audience.

The availability of electronic discussion groups and student assignment work on a teaching web site permits learning take place outside class meeting session. It facilitates peer learning by allowing students to evaluate their performance against that of their peers.

Computer mediated communication technology has simplified the task of creating a Web-based learning environment that would allow learner-content interaction, learner-teacher interaction, and learner-learner interaction. Teachers could focus on the design of learning activities that engage learners in these three different modes of interactions regularly.

Rice et al. (1998) argue that: "creating good Web-based instruction is not simply putting lecture notes online nor is it merely creating a virtual library of links to content related sites. It includes ensuring that good instructional, teaching, content, cognitive, visual, and usability design principles are followed as well as ensuring that it fulfills both teacher and student needs."

THE INTEGRATED MODEL

Combining the advantages of both the classroom and Web-based models of teaching provides an opportunity for enhancing the quality of both on-campus and online distance education courses. The strategy is fully compatible with the constructivist learning framework that associates with interactivity, social presence, cognitive strategies and collaborative learning.

Teaching in an online environment opens up new ways for creative teachers to guide and facilitate learning experiences. Teachers must focus on which learning activities are to be put on the Web and how these activities are integrated with classroom teaching. To decide the appropriate teaching strategies that match learning outcomes, individual learning style and effective linkages between curriculum, pedagogy and assessment remains a major challenge to the teacher.

IMPLEMENTATION OF WEB-BASED TEACHING

There are four disciplines of studies at Kwun Tong Campus of IVE : Business Administration, Computing, Electronic and Electrical Engineering, and Printing. In the past 10-12 months, as a pilot project of implementing web-based teaching, our colleagues dedicated their time and effort on the design and development of courses and modules on WebCT while training was taking place in the meantime. WebCT is a popular online course delivery tool currently used by many tertiary institutions. In addition to posting teaching and learning materials on the platform, some of them explored the functions of online quizzes, bulletins, mail, glossary and chat-room. Students taking Year One and Foundation Diploma in the four disciplines have completed a questionnaire survey to provide data about their current use of WebCT. Small groups of students from these disciplines have been given focus group interviews to invite more specific comments on the platform.

STUDENT ATTITUDES AND PERCEPTIONS

Focus Group Interviews Students find WebCT useful and practical in completing a number of tasks. They can download worksheets, handouts and lesson notes; submit assignments and upload projects; obtain model answers for tests or assignments; and send e-mails to teachers. Some of them also read the bulletin for more information. The CP students particularly appreciate the platform for they can practise what they have learnt on computer knowledge and skills on WebCT. In general, students can make use of WebCT mainly to perform administrative tasks for their modules whereas their exploration of other functions like self-learning, exchanging ideas and sharing information remains minimal.

Yet, some students have complaints regarding the administration of the platform. At the moment, off the campus, WebCT can only be accessed through an external Internet Services Provider (ISP). Majority of the students are reluctant to change their current ISP to another for access to WebCT. They also complained that the speed in downloading was low.

Majority of the students are satisfactory with the present teaching approach of lecture/tutorial/practical sessions together with web-based teaching. One essential remark from students is that an ideal learning approach will be composed of lecture/tutorial/practical sessions to be supported with the web-based instructions for self-study purpose.

Students have made suggestions as to how to improve the management of online courses. They suggested that WebCT should be accessible at home through any ISP for all students. It is of utmost importance that each student has an account in all the modules he or she is taking. The institute should exploit the full advantages of web-based instruction, promote and train students in all the features and functions of WebCT. All the modules should be posted with sufficient and useful materials on the platform, and also be more attractively and colorfully designed with graphics and animation. All the teachers should post model answers for tests/assignments on WebCT. Finally, the institute should provide an area on WebCT for students to post comments and ask questions on IVE matters.

Questionnaire Survey A questionnaire survey has been conducted to evaluate the results of the pilot Web-based teaching project in May, 2000. Questionnaires were sent to 705 first-year Diploma/Higher Diploma students from four academic disciplines of the Kwun Tong Campus. A total of 308 valid returns were received, corresponding to a response rate of 43.7%. The analysis of the data showed that:

- The majority of respondents (56% overall) are willing to spend 1 to 5 hours per week on Web-based instruction (Figure 1) and there are 21% willing to spend 6-10 hours on the same task. However, 6% of the students dislike Web-based instruction and opt for zero hour.
- Students consider that Web-based instruction should occupy about 10% of their total learning time. Figure 2 shows the percentage distribution of average time for various learning activities preferred by students.
- 60.9% of the respondents rate the quality of the learning materials presented in WebCT web sites as satisfactory or better.
- The results of the perceptions of the effectiveness of Web-based instruction are only fair. There are significant differences in the rating of the effectiveness of WebCT in improving learning on a 0 to 5-point scale among the four disciplines. The highest average score for the best discipline is 2.24 while the lowest average score for the worst discipline is 1.56.

LESSONS LEARNED

Staff interviews have been conducted to find out teachers' opinions and suggestions on the implementation of web-based teaching in our campus.

Staff Feedback Except for the Computing Section, only a small number of the staff of the other 3 departments were able to fully utilize the platform for online teaching and learning. Initially, the major reason would be the Computing staff are better trained and equipped in this area of knowledge and skills. Another reason is the lack of computer set-up in the classrooms which seems to discourage web-based teaching and learning in class.

There is a variety of communication tools on WebCT including courses content, bulletin board, private mail, F.A.O., calendar, on-line quizzes, course tools and other useful links. These features and functions enable the designer to post various types of information on the platform for learners. Without additional resources and support, the teachers have to take up the role of designer for their own modules. Majority of them have uploaded their teaching materials on the course content but are not familiar with the other communication tools of WebCT which requires more learning and practice before one can master them. It is difficult for the teaching staff to spare sufficient time on designing the online course materials in addition to their teaching and administrative workload.

Drawbacks of the Present System Limited accessibility to WebCT both on and off the campus is a major drawback in the implementation of web-based teaching and learning. It was reflected that staff need more support on clerical work and graphic design, besides continuous and systematic training on the tool. Moreover, students need to be motivated and trained to fully utilize WebCT, especially on the tools for exchanging and sharing information on the web, like bulletin and chat-room.

Looking Forward The overall effectiveness of the pilot Web-based teaching project has reached only a fair level in its first year of trial. Looking forward, there need to be measures which encourage and enable students to change their attitude about learning and understand both their own role and the teachers' role in a constructivist approach. We propose the following guidelines for the next phase of the project:

- Provide formal training to students who need detailed instructions on how to use the Web-based instruction tools.
- Plan for learning activities that demand students to use the various communication tools in WebCT for exchanging ideas and sharing information.
- Encourage the production of multimedia-rich contents that facilitate learning.
- Reward staff who are eager to experiment and devise useful Web-based learning activities.
- Continue to provide staff development training in the use of IT in teaching.
- Provide additional support to staff on the production of courseware.
- Identify and disseminate successful practices.

CONCLUSIONS

The Internet has revolutionized the way we communicate and created new paradigms for innovation in education. No matter what strategies or tools a teacher uses, the focus must be student-centred which means learning outcomes, individual learning style and effective linkages between curriculum, pedagogy and assessment. An intellectually exciting learning experience can happen in a classroom, a laboratory or the cyberspace. The art of combining the strengths of classroom face-to-face teaching and Web-based self-directed instruction will be a challenge to educators. In addition to management support and a fair reward system as drivers for improvement, success in the integration of information technology in teaching will rely on teams of teachers who are committed to learning, experimenting, collaborating and sharing their knowledge. The government needs to invest more money on web-based instruction if it wants to see advances in this direction, but should never replace teachers with technology.

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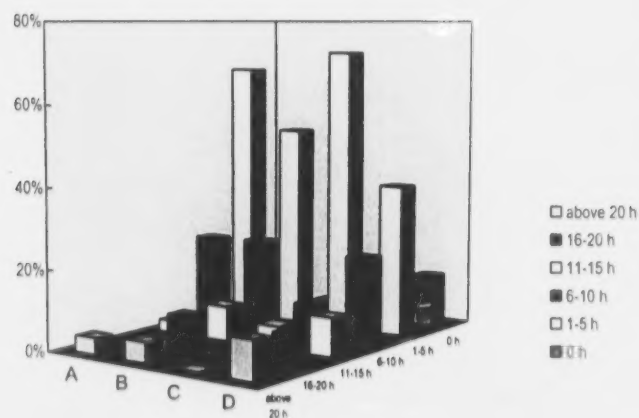


Figure 1 Percentage distribution of students who are willing to spend on Web-based instruction (categorized by disciplines and hours per week). ($n = 308$)

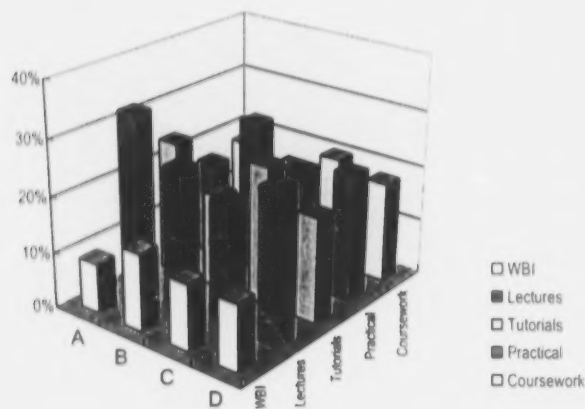


Figure 2 Percentage distribution of average time for various learning activities preferred by students of disciplines A to D. ($n = 308$)

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WEB-SITE TEACHING: ANALYSIS OF ITS FUTURE DEVELOPMENT

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Abstract: Web-site teaching has become increasingly popular in universities and continuous education. This article discusses the advantages of web-site teaching. In particular the effect of web-site teaching on life-long learning is examined. It is concluded that web-site teaching will have large scope of future development and that education institutions especially those aiming at providing life-long learning to mature working people will need to start preparing for this revolutionary change in method of teaching.

INTRODUCTION

The use of IT in education has become a trend nowadays. In particular, web-site teaching has become increasingly popular in University teaching. Indeed technology has developed so rapidly that methods of teaching unheard of a decade ago are commonly used now. Development in information technology has not only transformed the way of communication, but has exerted its influence in education and has changed completely the traditional method of teaching.

There are motives for teachers and lecturers to adopt new information technology in their teaching. Firstly, the adoption of IT considerably enhances the effectiveness of teaching. Secondly, IT such as web-site teaching provides a high degree of flexibility for the students in pursuing their study. They can study at home or in their work place in front of computers connected to the internet. They can study at the time convenient to themselves and at a pace suitable to themselves. Thirdly, IT such as web-site teaching has considerable cost advantages to the teaching institutions since it does not require much classroom resources and needs only the minimum face to face teaching, the result of which is substantial savings in manpower. Lastly, but most importantly, IT such as web-site teaching provides the path for life-long learning which has been so much stressed nowadays as a human resource policy.

THE ROLE OF 'IT' IN RAISING TEACHING EFFECTIVENESS

Education nowadays is no longer the privilege of a small group of people in society. It has become something that everyone has the right to access. Education has the effect of satisfying human want for knowledge. The acquisition of knowledge itself raises a person's self-esteem, confidence and brings about happiness. Education viewed this way is consumption in the words of economists.

However education is now generally regarded as investment rather than consumption. It is an investment in 'human capital'. The acquisition of knowledge yields a return, which is the higher income to be earned in the future. People are thus motivated to make effort to study. Study is

therefore seen as an effective tool to combat poverty and to improve one's standard of living. Education has become a way for upward social mobility. (Schultz T.W. 1960)

With the great increase in demand for education, and the policy of the government to expand education, teaching institutions especially the universities are under tremendous pressure to increase supply of education, and more precisely, of good quality education. The traditional form of teaching whereby the teacher conveys the subject matter of a discipline verbally and through writing on the board is no longer sufficient. Audio and visual aids are needed to help teaching. Computer teaching is a great progress, as interest of the students can be considerably enhanced. Now web-site teaching, an elevated method of computer teaching, provides the maximum flexibility and efficiency for teaching.

There have been great disputes on what should be considered as good teaching. Classifications such as 'teacher centred teaching and learning', 'student centred teaching and learning', 'surface approach of teaching' and 'deep approach of teaching' etc have been under discussion by academics in education. But it is generally accepted that good teaching occurs when students succeed in acquiring knowledge and are able to make use of the knowledge, i.e. to apply it. In this respect, IT is an effective instrument to bring about good teaching, as it provides efficient communication through which the subject matters of a discipline are transferred from the teacher to the students and feedbacks are transferred from the students to the teachers. IT being a fast and powerful means of communication indeed is an effective instrument for teaching.

FLEXIBILITY OFFERED BY WEB-SITE TEACHING

The idea of 'consumerism' has been increasingly becoming popular in education. Education is now considered as a good which consumer buys. As such education needs to be of good quality, to fit the purpose of consumers and to be distributed to them at the time and place most convenient to them. Web-site teaching can adequately fulfil these requirements. A student with a computer connected to the internet is able to pursue his/her study at the time convenient for him/her, at the place that suit him/her, and at the pace that fit his/her ability.

The change from traditional programme-based system to credit-based system is in fact a step to provide flexibility to students in programming their studies. Web-based teaching provides further flexibility to the students in managing their studies. When credit-based system is combined with web-site teaching, flexibility becomes really great!

COST ADVANTAGE OF WEB-SITE TEACHING

As the demand for education increases, increase in supply should follow. Teaching institutions especially the universities are now under heavy pressure to supply education for more students. However as education is costly, most governments are reluctant to provide substantial funds to the teaching institutions. In view of this web-site teaching is a feasible solution to the problem. It allows teaching to take place for numerous students at the same time. So there is tremendous economies in the delivery of lectures as it saves classroom resources and manpower resources. The idea of cyber-universities has emerged whereby a university may teach only through web-site, running its educational programmes with very low costs.

With web-site teaching, the market for the cyber-universities is enormously expanded. Its market is not limited by geographical constraints as the internet can reach every location in the world. So

web-site teaching does not only lead to cost savings, but to great increase in the demand for its services.

ROLE OF WEB-SITE TEACHING IN LIFE-LONG LEARNING

Traditional thinking is that one needs only to take up enough studies for acquiring a job or engaging in a profession. As knowledge and technology are continuously increasing and improving, it is now generally recognized that learning should be a life-long process. This is a "cradle to grave" perspective of education.

Life-long learning challenges the notions that learning belongs only to the classroom and the idea that learning is essentially a pre-experience formative process. Life-long learning requires the rethinking of the functions of education institutions and the nature of learning in a knowledge-based society. (Chris Duke, 1999, p.22)

Life-long learning have made the traditional study programme not quite workable. Students in a programme may come from all age and background. Full- and part-time students are not easy to identify clearly, with respect to their background, study programmes or employment status. Young and mature age, working and non-working, degree-seeking or for personal interest, now are likely to be taking part in the same teaching learning process. This is the picture of life-long learning. (Alan Wagner, 1999, pp.58-59)

In deed life-long learning has been put into the aim of university education. Students are supposed to be educated in such a way as to be able to pursue life-long learning after leaving college. The provision of a scheme for life-long learning is now the concern of most governments. It is their preoccupation to set up schemes which are effective and inexpensive for providing life-long learning to their people.

The flexibility offered by web-site teaching can contribute to the life-long learning process. It is envisaged that more and more adults will be engaging in study programmes through internet teaching. There will be more adults enrolling in degree courses doing their studies part-time through internet teaching. Those who want to up-grade their knowledge of their work or profession will enroll in specially designed courses taught through the internet. Continuous study is so easy and convenient with a computer connected to the internet.

In providing life-long learning through Web-site teaching, effort must be made to design course materials for different categories of students. According to Martin Trow (1999, p. 207) we should disaggregate the pattern of use of IT very finely along at least four crucial dimensions, i.e. by the nature of the subject taught, by the location of the student (whether inside a college or university or at home or at the workplace), by the purpose of the instruction (whether to transmit skills and knowledge or to cultivate mind and sensibilities) and by the academic talents and motivations of the learner.

Policies in life-long learning must be set to suit the diversity of student population. It is inevitable that experiments are to be taken with initiative from below rather than from top. According to Martin Trow (1999, pp.207-208) if the provision of lifelong learning is to suit the diverse student populations, then policies for continuing education through the new media of communication must be responsive to the nature and goals of the educational effort, almost course by course, to the market for knowledge among consumers and to the judgement of the academics who know better than anybody who they are teaching and how those students learn. How these conflicting requirements – of function, demand and pedagogy – balance out cannot be the subject of general rules or state policy. On the contrary, it means that policies must allow – indeed encourage – experimentation by those who introduce the use of these technologies into higher education, and

especially into distance learning. He therefore advocated that institutions and the people in them should be given the freedom and resources to initiate from below and to experiment in different directions, and that policy-makers must accept the possibility of failure in some cases. (pp.207-208)

Researches are urgently needed to find out the impact of web-site teaching on life-long learning. Such impacts are complex in nature. The convenience of taking up a course through internet may increase the demand for such courses. The response to the availability of web-site teaching may be different for different categories of people. The pursue of life-long learning may change the life-style of people, their family relation, their spending pattern, their interest and so on. All these aspects are unknown, as the outcome will take place only in the future. (Martin Trow, 1999 p.203)

RESISTANCE TO ADOPT WEB-SITE TEACHING

In spite of the advantages brought about by the introduction of IT especially web-site teaching, there is resistance from some teachers and students. New education technology has impacts both on the teachers and the students. On the one hand, new technology helps to increase the efficiency of teaching on the part of the teachers and provides greater degree of self-study and critical thinking on the part of the students. On the other hand, there is resistance to change since it is new and requires efforts to acquire the skill for the adoption of the new technology.

Some teachers or lecturers who are already accustomed to the traditional way of delivering lecture may find using computer teaching especially web-site teaching difficult for several reasons. First, they have to learn the new technology before they can make use of it. Second, they have to rewrite all their teaching materials and input them into the computer, which requires substantial works. Also repeated testing of the teaching materials is needed before they can be used. Third, there is considerable risk associated with the outcome of computer teaching. Students may not be able to follow. They may not like it. They may need assistance in order to use it. Therefore it is something new and a risk-averse lecturer by nature would reject it.

With computer-facilitated learning, increased independence on the part of the students has become a goal or a desirable side benefit of the innovation. These innovations generally have direct or indirect impact on other aspects, such as coursework and assessment, which further provides opportunities for increasing the self-reliance of the students. However the innovation may not be accepted instantly by the students. So measures must be taken to ensure a smooth shift to the new educational technology. Otherwise, discouragement on the part of the students will bring about failure in the teaching-learning process. Many students still have the concept that teaching must be in the classroom and with the assistance of the teacher near by. However in web-site teaching, the student is left alone sitting before the computer without a classroom environment and unaccompanied by his/her class-mates. This is a complete change of the mode of teaching and learning. So there must be a kind of preparatory works to smooth out the psychological shock of such a change. (Akerlind and Trevitt, 1999, pp.97-98)

It is advisable that the adoption of web-site teaching be carried out in two stages. In the early stage some web-site materials are posed in the web-site so that students can have access to them. But at the same time lectures and seminars are still provided. In this way students will have the chance to attend lectures and seminars. In the later stage, teaching will then be carried out totally through the web-site. With such a transition arrangement students will find it easier to adapt.

The above transition arrangement will also be beneficial to teachers and lecturers, as they can have more time to prepare their web-site materials. In the early stage, they need only to prepare notes, multiple choice questions, basic activities, etc., which they may already have prepared for the traditional lectures and seminars. It is only in the later stage that they need to up-grade their

teaching materials for a complete web-site teaching. Also it is advisable for the teaching institution to provide technical assistance to the teachers and lecturers for the preparation of the web-site materials. In the Hong Kong Polytechnic University, funds have been granted to the Education Development Unit to help teaching staff to carry out web-site projects. These funds are used to employ technical staffs and students helpers for the preparation of materials for web-site teaching. Staffs are thus encouraged to embark on these projects without the feeling of being forced to adopt the innovation.

CONCLUSION

What conclusion can then be drawn? Certainly the use of IT especially web-site teaching will become increasingly popular. The impact of introducing web-site teaching on traditional methods of providing teaching is great. It changes the way teaching is conducted. It changes the structure of the education system. It changes the views of people on learning. Its effects spread into practically all aspects of people's lives.

As educators, we must be prepared for these changes. We need to up-date our skill of web-site teaching and to design programme materials for web-site teaching. We need to research on the possible effects on teaching and learning because of the adoption of web-site teaching. Indeed there will be a renewed emphasis on teaching as against research. (Sarah Guri-Rosenblit 1999, p.286)

For institutions that target at the life-long learning market, there are lots of areas they should consider. How is the development of such a market? What are the products demanded by the consumers? How large is the market? How should the market be served?

As the competitors in this market are many, i.e. the universities, the vocational training institutions, overseas educational institutions, etc., competition will definitely be keen.

For certain, things are to change tremendously and rapidly. It is time now for us to make plans and provisions for the changes. A new era has come in which information technology will play the main role in education.

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USING THE WEB TO ENHANCE LANGUAGE TEACHING AND LEARNING AND DISTRIBUTED COGNITIONS IN A CONVENTIONAL SUB-DEGREE SETTING

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Index: IT, Distributed Cognitions, interaction, English teaching

Abstract: This paper examines the functions and uses of IT, specifically the internet for educational purposes in general, and for the teaching and learning of English in a sub-degree course in particular. The design of an exercise in an English course at sub-degree level, with the objective of using the web to encourage interactive discussion among students and staff and the development of distributed cognitions (Pea, 1993) and "person-plus" (Perkins, 1993) in the students, is looked into and its effectiveness analysed. Some of the problems arising from the exercise are discussed as well.

INTRODUCTION

The buzzword which is carried over from the last decade of the 20th century into the new millennium is information technology (IT). To the information technologists, the internet, which makes a significant component of information technology, is an epoch-making idea and the most transforming invention in human history. The internet is predicted to turn business "upside down and inside out" within a year (The Economist June 26th 1999, *Business and the Internet*, p.1). If information technology is expected to have such revolutionary effect on the business world, what impact does it have on education, and in particular, language education, which is considered particularly resistant to the application of information technology?

This paper sets out to examine the use of IT for educational purposes at tertiary level, with a particular focus on how the web is used to improve the teaching and learning of English, and to enhance the learners' distributed intelligence in a conventional educational environment (conventional vs. distance learning type) at sub-degree level.

BACKGROUND TO THE USE OF INFORMATION TECHNOLOGY IN TEACHING AND LEARNING AT CITY UNIVERSITY

The case study this paper examines is based on the development of a web-based exercise in an English course in City University of Hong Kong. Despite the availability of many high-tech computer facilities in the City University of Hong Kong and its high-tech image, much of the use of computers in the teaching and learning of many courses (particularly humanities ones) at the end of the millennium has been restricted to the use of PowerPoint slides in lectures, and the use of email for staff-student communication outside the classroom. For the more innovative teachers, their attempts in using IT have been limited largely to putting PowerPoint slides, course materials, tests and exercises on the web for student access. As stated in the University's Strategic Plan for the Development of Information Technology announced in May 1999, the predominant use of IT to support learning, teaching and research throughout the University "will revolve around the Internet

and the growing use of the Web to present course materials and to assist in the complex process of course management”.

The language teachers in general have been rather sceptical about such applications of information technology as most of the language teaching is done in tutorials rather than lectures, hence putting PowerPoint slides or course notes of lectures on the web is not relevant. On the other hand, putting multiple choice or fixed answer type of exercises or tests on the web represents a very limited type of activity which is too restrictive for teaching and learning of languages at an advanced level when students are encouraged to use the languages more for creative and interactive purposes. Many of the language teachers believe that since much of language teaching and learning should be done through face-to-face or interpersonal interaction, computer-mediated communication, which obviates face-to-face interaction, will severely constrain it.

While many language teachers realise that they need to change and adapt some of their teaching methods and approach to incorporate the use of IT so as to meet the stated institutional goals and strategies, they need to think hard on how they can use IT profitably to enhance interaction. To be able to maximise the benefits of IT, it is necessary for them to understand what the new technology involves, what opportunities it can and cannot afford. As Fullan rightly points out, for change to be brought about effectively, those responsible for implementing change need to make sense of what change is about and why it is being suggested (Fullan, 1982). As frontline change agents, we need to face change ‘head-on’, “exploiting change before it victimizes us” (Fullan, 1991:345).

CONTROVERSY ABOUT THE USE OF IT IN LANGUAGE EDUCATION

Much of the negative feelings about the use of IT in education paradoxically arise from what is originally its strength. The expectation that the use of IT “will free education from the constraints of time and space”, as proclaimed by a UK university vice chancellor (M.Fitzgerald, *Times Higher*, July 1996), strange enough is also perceived as a threat and a limitation. Besides the fear that such development “threatens the sense of community inherent in conventional institutions that is so valuable to students” (Light and Light, 1999: 162), there is also a fear that students will be cut off from interaction with each other in communicating with and through the computer, as Light and Light (1999) point out, “Information technology is sometimes seen as threatening to cut learning off from the interpersonal contexts which give it meaning and utility” (163).

A closer look at what learning involves will reveal that it is not just “a property of the minds of individuals” as many people believe (Pea, 1993: 47). As Pea points out, practices of cognition or learning rarely works alone. In Pea’s terms, human cognitions are distributed, “The intelligences revealed through these practices are distributed – across minds, persons, and these symbolic and physical environments, both natural and artificial” (1993: 47). It’s only through activity that “connects means and ends through achievements” (ibid.: 50) that distributed intelligence is manifest and realised. Hence learning in educational settings, should not be concerned largely with solitary intelligence as they seem to have been now, but rather, it should be concerned with the development of intelligence distributed across minds and persons through fostering interactive activity. Pea also argues that “computer technologies mediate human interactions with nature, information and other persons in distinctly different ways” (ibid., :57), just like the use of physical machinery in farm labour.

Harping on a similar note, Perkins (1993) advocates the ideal of an educational process “oriented more toward the person-plus, empowering learners to capitalize with greater awareness and art upon the cognitive resources afforded by the physical and human resources around them – indeed, empowering learners to construct around themselves their personal “plus”, their own surround for

an agenda that will evolve with that surround" (Perkins, 1993:106). It is important for an educational institution such as a university to encourage interaction in a group which "involves a multitude of complications and a maze of cross-talk not encountered in solo decision making" (ibid.: 98). Hence any use of the web for teaching and learning purposes should help empower the learners to make full use of the physical and human resources around them through interaction and collaboration.

Language teachers are particularly concerned about the development of the person-plus and enhancement of distributed cognitions among the learners, because language as a form of social behaviour involves communication between, and among people (Oxford, 1990: 144). As language learning involves interaction with other people and social strategies are very important in the process of learning a language, IT will have to be able to enhance interaction.

Can IT enhance interaction? In offering a socio-cultural perspective on the human-technology link, Säljö argues that it can. He points out that the full realisation of the potentials of such experiences "will rely on students' access to conversation partners who carry on discussions". He stresses that "technology should not be seen as replacing such communication but rather as providing a resource for supporting it" (1999: 159). Even in 1989, Graddol already points out that one of the advantages of computer mediated exchange over interaction in face-to-face settings is that it does not depend in the same way upon interruption and attention-getting skills. Bannon (1995) also argues that computer-mediated exchange can provide opportunities for those students who are too inhibited to speak out in face-to-face situations.

Fetterman (1998) in discussing the beneficial use of the web for educational research and instruction, cites the case of "virtual classrooms" that he set up on the web at Stanford as an example to illustrate how the web could be used for generating interactive discussions. A discussion is generated through the critique he provides of students' assignments posted onto a series of folders, as well as criticisms and comments from the peers. He sums up the benefits to be "the ability of students to see one another's work and thus benefit from a peer review, time for thought and reflection through posted comments, the ability to save or archive discussion for analysis or additional discussion, the ability to conduct classroom instruction or to post messages while travelling or being on site" (28). However, he also acknowledges that there are some problems such as "initial difficulties navigating around the virtual classroom and visibility" when "everyone is on display" and "faculty need to respond to each student's comments". The benefit of transcending "the boundaries of the classroom" is both a benefit and a drawback: the extensive discussions leading to endless dialogue incurs much more "additional discussion time" (ibid.)

In looking into the case of skywriting (a term coined by Hamad (1990) to refer to the use of multiple reciprocal e-mail in academic discussion) in the University of Southampton, Light and Light (1999) report a very similar interactive experience using the web for discussion which resembles that of a symposium (165). However, they also find that the predominant mode of exchange is one of question and answer rather than critical comments which the students feel uncomfortable about. They observe that even at this level, students seem to have difficulty in separating personal criticism from criticism of ideas. (ibid., 1999: 171-175). Furthermore, none of the students in the skywriting project "would willingly have sacrificed face-to-face sessions in favour of skywriting" (ibid. 1999:175). That means the use of such information technology can only have a supportive role and cannot replace face-to-face contact, and hence cannot save educational institutions from the constraints of time and space.

THE DESIGN AND IMPLEMENTATION OF A LANGUAGE TEACHING ACTIVITY USING THE WEB

With the discussion on and examples of what IT and the computer could and could not do, as well as should and should not do for teachers and learners in the background, the designer of an English course in City University of Hong Kong then set out to develop a web-based activity in writing in the first Semester of 1999. Understanding that in a software package developed by University of British Columbia called WebCT, there is a bulletin board feature which is a kind of chatroom, allowing users to post their writing and readers to respond, the designer of this English course decided to use this feature for developing a writing exercise.

This English course concerned is the first common English course offered to the first year students of four sub-degree language programmes, which are Higher Diploma (HD) in Applied Chinese Studies, HD in Applied Japanese Studies, HD in English for Professional Communication and HD in Translation and Interpretation. The English level of students varies a great deal as these different programmes have different admission requirements for English. The students' level of competence in English in this course can vary from that of the very competent second language users to that of the relatively weak ones.

As most of these students come from a secondary school environment which is teacher-centred, the assumption is that students who have come through an educational system as such usually have not had much opportunities to use the language actively for interactive purposes. One of the purposes of the course is to activate students' competence in English as a second/foreign language, which they have acquired in both their primary and secondary education, and provide them opportunities of putting their latent competence into active use. To encourage students to express their ideas freely and to practise their writing skills, the course designer previously developed a journal writing exercise, asking students to write three journals in several weeks. However, the exercise was done by students individually, with practically no element for sharing of ideas, not to mention collaboration, among the students.

The course designer saw the bulletin board feature of WebCT as a very good tool for developing collaboration and distributed cognitions among students and decided to modify the previous writing exercise to incorporate the use of this feature. Instead of asking students to write three separate journals in several weeks, the designer assigned each tutorial class two weeks for collaborating in writing journals/diary entries to cover each day of the designated two weeks. Different classes were assigned different weeks for posting the journals onto the bulletin board on WebCT set up for the course. Students were also asked to ensure that there were more than two journal entries for each day as they were asked to select the best journal(s) for each day to be posted onto the bulletin board. The students had to work out among themselves a roster system in which the journal entries on each day were covered. To ensure fairness, they discovered that they had to discuss among themselves in class a way of assigning the writing task so that no one would have an "unfair advantage" over the others. (Students having to write the journal on weekdays were perceived as having drawn a short straw and those who had to write on a Saturday or Sunday as having an advantage since they would have more time to do it and they might have more to write about as well). So even in working out a reasonable and equitable work schedule among themselves became a good opportunity for training not only their spoken English communication skills, but also their distributed cognitions and 'person-plus' in problem solving. It also provided students a good reason for collaborating with each other in working out a reasonable scheme. Furthermore, the fact that their journal entries would no longer be restricted to the readership of the tutor, but rather, would be read by the rest of the class, and if written well, would be read by other students and tutors of other classes, gave them the desire and motivation to put more effort and thinking into the writing task.

After writing out their diary entries, students were asked to bring to class a hard copy of their journals and post them up on the walls and boards in the classroom according to the day of the entries. Students were asked to walk around in small groups of two to three, reading the posted up journal entries, giving short written comments and suggestions for improvement on the side or at the end of the journal, which was another opportunity for students to collaborate with and help each other in writing. Afterwards, students were to select among themselves the better written journals for the day to be posted onto the course bulletin on WebCT. Over the selection process, they had to justify to the other students in the class why they thought a particular journal was better written than the others. Students whose journal entries were selected were asked to do revision, taking into account of other students' comments and suggestions, before posting the entries onto the WebCT bulletin board for the course.

Following that, students were encouraged to log onto the bulletin board of the course on WebCT to read the journal entries from the other tutorial classes as well as from the other programmes and give immediate feedback to the posted entries they have read. Feedback comments from the readers on the journal entries were listed under the corresponding posted entries so that the other readers could also share their views. The composers of the original journal entries could easily check against their own entries what feedback they have obtained from the readers. New entries either in form of diary journals or in form of feedback were flagged with an icon to facilitate the readers.

EVALUATION OF THE SUCCESS OF THE WEB-BASED ACTIVITY

The achievement of the objectives of the activity using WebCT was evaluated in several ways. Globally, the whole activity was reviewed to see if the students' distributed cognitions and 'person-plus' were enhanced through observation of students' response in class as reported by the respective tutors as well as on the bulletin board. Feedback from tutors on the teaching team and students were obtained through interviews. The specific improvement of students' writing skills was looked into through verbal feedback from tutors and students.

From tutors' reported observation of students' discussion in working out a reasonable schedule for collaboration, students' interaction in negotiating for the most reasonable scheme was both natural and enthusiastic since it was in everybody's interest to work out a schedule acceptable to all. In a subsequent session when students walked around the class to give comments and suggestions to each other, they were also reported to be very spontaneous in giving encouraging comments to each other, demonstrating much interaction between the writers and the readers. There was sufficient demonstration of their development of distributed cognitions and person-plus in these pre-web forum activities generated. However, similar to what Light and Light (1993: 171) reported in their study of skywriting in University of Southampton, students were rarely critical of each other's work.

In terms of feedback on journal entries in the bulletin on WebCT from both students and tutors, the response, particularly in the first five to six weeks, could be said to be enthusiastic. However, enthusiasm in writing feedback tailed off towards the end of the semester, as the novelty began to wear off and deadlines for other assignments came in a crunch. The feedback to the posted journal entries given in the bulletin board was also mostly encouraging remarks or sharing of similar ideas or experience.

When asked why their comments and feedback concentrated mainly on sharing of ideas, experience and encouragement rather than critical comments on how their peer writers could improve their writing, the majority of the students said that they didn't want to "hurt the others' feelings" or "hurt the friendship". Another possible reason that the tutors guessed was that the students didn't want to

receive critical comments from their fellow classmates. They tended to take critical comments from their fellow classmates rather personally and they were afraid that their critical comments might be reciprocated. Furthermore, many students felt that critical comments should best be given by the tutor or a person with authority. A student said that she felt students could learn better from encouragement and praises rather than criticisms. She cited her sense of failure in the past developed from the criticisms she and her classmates received in her secondary school days as an example. That was the reason why she had been giving positive and encouraging feedback to her fellow classmates as well as to the journal writers from the other classes.

The tutors found the discussions generated both in class before and after the students' writing and on the web to be very engaging, spontaneous and interactive. Students interviewed also reported to have developed an interest in reading journals and comments posted on the web by other classes and giving their feedback to some of them, a form of interaction which students could not have without this feature of WebCT. They were also interested to find out how well the other students could write and what range of topics they could write on. Many of the students felt that they could learn from each other not only writing skills, but also some of the subject matter and experience cited.

Tutors who taught the same course last year also reported better quality writing in the journals as students were aware of the wider readership of their writing. A number of tutors have given encouraging comments to students' journals from students of the other classes on the bulletin board, which gave much incentive for students to check up the bulletin board regularly.

All in all, the global and specific purposes and objectives in the design of the activity can be said to have been achieved quite successfully. It was considered a very useful learning experience to the course designer, tutors and the students. However, like what Fetterman (1998) points out, extending the discussion "can lead to endless dialogue" (28). Even though they found the activity to be useful and rewarding, they all felt that they had spent a tremendous (perhaps a disproportionate) amount of time on it.

IMPLICATIONS FOR FUTURE DEVELOPMENT

From the case study on the use of the web in the development of a writing exercise in a conventional university setting, we can see that IT can be used to promote and develop interaction among students. Instead of using IT just for course material presentation and course management purposes, which are very much teacher-centred and unidirectional, IT could be used profitably for interactive, collaborative activities in form of a discussion forum. Through exploring and exploiting such features of IT, not only can the students' distributed cognitions and person-plus be further developed, but their interactive and interpersonal skills as well as writing skills can also be enhanced. Language teachers should no longer dismiss IT as incompatible with interactive language teaching and learning, but instead, should take an active role in exploring its strengths to enhance the effectiveness of teaching and learning.

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THE EFFECTIVENESS OF USING TECHNOLOGY TO TEACH ENGLISH AS A SECOND LANGUAGE

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Index: Technology, Learning English, Web

Abstract: This study focuses on the effectiveness of using technology such as e-mail and websites in teaching and learning English. Around 50 in-depth interviews were made with teachers and students in the College to examine the effectiveness of using technology, such as e-mail, websites as teaching tools. Through such analysis, we can develop a better understanding on the students' and teachers' perception of their language abilities and effectiveness of using e-mail and websites for teaching. If there is a wide discrepancy between teachers and students' perception, it is better to equip our teachers with better understanding of the students' problems when using such technology.

INTRODUCTION

Developing an effective curriculum has always been a major concern of teachers. Changing technology has changed the nature of many jobs including the ways of teaching. Teachers need to keep up with the latest development in communication technology. However, new technology alone does not make teaching operate smoothly and learning effectively. It is essential for us to decide which technological tools we will use to enhance the teaching process and effectiveness.

In Hong Kong, the College of Higher Vocational Studies of the City University of Hong Kong particularly aims to provide programs to meet the needs of students, their future employers and the community of Hong Kong. Teaching quality is particularly emphasized in the College. Business and industry are beginning to acknowledge the benefits of language skills and seeking to employ people having them. Better specification of vocational needs is needed. In addition, more language resources should be made available for teaching languages. With the fast development of advanced technology, such as Internet, e-mail etc., it is inevitably important for teachers to use technology as one of the delivery modes of teaching (Cox, 2000.) This paper is to examine the value of using technology in terms of delivery mode in teaching English as a Second language. Finally, suggestions will be made on how to optimize the use of technology for teaching English as a Second Language.

LITERATURE REVIEW

"Learning is seen to occur by making sense of knowledge one is exposed to and with which one interests by way of mental processes and interaction with other people" (Pachler, 1999, p.7). For behaviourist ideas, learning is broken down into a sequential series of steps, each covering a piece of subject domain. Computer is essential for modeling the role of tutors offering some input or information that the learner can "drill and practise" followed by provision of feedback. As

mentioned by Warcheur (1996), repeated exposure to the same material is beneficial or even essential for learning. Internet can provide huge amount of information, which can serve as a very good modeling role for students to learn English. For students with low proficiency, they can also refer to the computer program repeatedly for more controlled and guided practices.

Cognitive theory of learning sees the learner no longer as passive recipient but as mentally active participant in the learning process. As such, the learning of brains in terms of rules and models of information intake, storage and processing is emphasized. As teachers, we need to present the students' required skills in ways that meet the varied learning needs and learning styles of students. Using technology can make a significant contribution to this process because information can be packaged in a variety of contexts and styles.

It is also a prevailing view that is beneficial for teachers to be aware of students' preferences of their learning environment (Pachler, 1999). According to (Ellis, 1994), students can be categorised into four learning styles, concrete learning style, analytical style, communicative learning style and authority style.

General learning Styles

Main characteristics

- | | |
|--------------------------------------|--|
| 1. Concrete learning style | Direct means of processing information; people oriented, spontaneous; imaginative; emotional; dislikes routinized learning; prefers kinesthetic modality. |
| 2. Analytical learning style | Focus on specific problems and proceeds by means of hypothetical-deductive reasoning; object-oriented; independent; dislikes failure; prefers logical, didactic presentation. |
| 3. Communicative learning style | Fairly independent; highly adaptable and flexible, responsive to facts that do not fit; prefers social learning and a communicative approach; enjoys taking decisions. |
| 4. Authority-oriented learning style | reliant on other people; needs teacher's directions and explanations; likes a structured learning environment; intolerant of facts that do not fit; prefers a sequential progression; dislikes discovery learning. |

Source: Ellis (1994) p.506

Certainly, there is still uncertainty over which learning style works best, this aspect of cognitive psychology is of relevance for teaching in general and the use of technology in particular (Pachler, 1999). It is advisable for teachers to be aware of the variety of preferences among students about the learning styles. Teaching approaches and methods need to be varied. New technologies only offer one of the many possibilities to provide varied learning opportunities. Thus, it is essential for teachers to collect feedback from students and teachers regarding their perception of the preferred modes of learning in order to create an appropriate learning environment for the students.

METHODS

Procedures

Around 50 interviews from students and teachers were conducted to collect the feedback on the effectiveness of using technology such as website, email, discussion board, and PowerPoint presentation for learning language. A summary of the data was collated in Table 1 and 2.

Table 1

Comments from students	Frequency
Website	
Very user friendly and easy to use	36 (90%)
Very useful for collecting data for writing papers and presentation	38 (95%)
Could improve reading skills by reading the information from relevant websites and also samples of documents	32 (80%)
Too much information, have difficulty in selecting the relevant information	14(35%)
Time consuming	10 (25%)
E-mail	
Good for communication	35 (88%)
Quite a lot of technical problems	5 (13%)
Could save time and money when submitting assignments	38 (95%)
Never read e-mail messages	2 (5%)
Discussion Board	
Interesting and could get feedback from teachers and students	4(10%)
Have difficulty in giving comments to other students' work	15 (38%)
No time to take part in the discussion	34 (85%)
Downloading notes or materials from websites	
Too expensive	25 (63%)
Could provide more flexibility to the students	30 (75%)
Too slow	35 (88%)

Table 2

Comments from teachers	Frequency
Websites	
Good for retrieving data and information	9 (90%)
May not be able to guarantee quality work	5(50%)
Should provide more guidelines on the selection of materials from websites	8 (80%)
Teachers need to be more aware of the learning goals and learning styles of the students when using technology as a delivery mode	9 (90%)
Ethical problem	2(20%)
e-mail	
Good for communication, speed up the communication process	10 (10%)
Time consuming to give feedback to students' messages or assignments	7 (70%)
Downloading notes from websites	
Visual impact on students- raise motivation	6 (60%)
Technical problem when uploading the materials on website	5(50%)
Could provide more flexibility for students	7 (70%)
Save time and money	7(70%)

Websites

Around 90% of students and teachers agreed that websites were very user friendly and provided a lot of information for learning and acquisition of skills. In particular it was a very good tool for providing samples and information package. Most students made use of internet to collect information, materials and sample work. It was rather difficult for some students to find the appropriate websites, for example, one student pointed out that she had great problem in finding a website on which she needed to make comments as an assignment. One student also pointed out that she spent a lot of time in searching the appropriate materials for her project because she could not enter the right key words. Four students indicated that they could not make use of internet to collect information regarding the current controversial issues. A few students mentioned that they had difficulty in surfing the internet because they were not very familiar with the availability of the websites.

e-mail

Students favoured email communication very much because it was very user-friendly and convenient. They would be very frustrated if teachers never sent them feedback. Some students responded that submitting assignments through e-mail could save money and time for them. Even so, around 10 % of the students never read email messages.

Teachers found e-mail a very convenient channel for communication. However, sometimes there would be email jam and virus problems if there were too many email messages. It was quite time consuming to retrieve assignments and reply email messages every day.

Discussion Board

A few students (only 10% or even 5% for some of the courses) responded to the discussion board. Around 80% students found it time consuming and those who had participated in the discussion board usually found this activity interesting and worth doing. They could make improvement from the feedback of the tutors and peers regarding the content and style of the assignments. For peer discussions, students needed encouragement for giving comments on others' essays. Ten students said they did not know how to give comments.

Teachers generally favoured a more interactive approach for web teaching. It was sometimes time consuming to give feedback to students but students' work could be improved a lot if they actively took part in the discussions. Teachers should monitor the progress and encouraged the students to participate. More importantly, the design of the activity should tie in with the learning goals and learning styles of the students.

Downloading handouts, notes from website

Most students found it convenient to download materials from websites but some of them commented that the process was too slow. Some responded that it was rather expensive and time consuming to download materials. It would be good to use the materials as references. Some teachers did not favour the idea of uploading the handouts on the websites because students would tend to be absent from classes if they found all the materials on the websites. The outline of the lectures could be uploaded for students to browse before they attended the lecture. It could be money saving and time saving to upload the materials on the website from which students could have more autonomy for learning.

Others

Most students found that Power Point presentation could be very boring if the presentation was too long (for example, more than 20 minutes) but using Power Point for short presentation(10 minutes) was very advisable. It was rather surprising that a few year one students were not very familiar with the use of computer. They found it very confusing to use software even Microsoftword for typing. They had a lot of problems with the use of internet. One teacher found that it was time consuming to use high technology for teaching and this teacher tended to withdraw from using it and did not find it a very effective teaching tool either.

SUGGESTIONS

Learning is a part of our life. The term "learning" denotes a broad range of activities and process, which could be regarded as a cooperative interpersonal communication process between persons that mutually play different roles. An increasing portion of the human effort is devoted to the challenge of coping with increasing amount of knowledge and with rapidly changing demands for skills required by the business world and the private world. An individual has to find effective ways and means to keep up with these challenges and changing conditions (Muhlhauser,1995). It seems that it is unavoidable for teachers to use technology as one of the delivery modes which can help us keep abreast with the rapidly changing world. Based on the above findings, it is concluded that in order to increase the efficiency of teaching, the following issues should be addressed to create an appropriate learning environment for using technology (Muhlhauser,1995).

- Learning goals
- Learning styles
- Learning reduce instruction time
- Increase retention rate
- Control the learning process

When using technology, we need to consider the learning goals, the subject and requisite skills, for example, if we emphasize on process writing, tutors' comments may be essential to the learners. The use of email tutoring or discussion board (Coogan, 1998) may be better than sampling documents on the websites. Understanding the learning styles of the students could enhance the learning environment. Students' language needs, learning styles, and computer knowledge should be considered when using the technology for teaching to adapt to learners' preferences and individual learning needs. Increase the retention rate is by raising motivation. Using technology will have a visual impact on students, which can increase their motivation and retention rate. Finally, it is very essential for the teachers to monitor the learning process by using technology. He or she must be aware of when and how to acquire new skills and knowledge.

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WEB-BASED VOCATIONAL ENGLISH: DEVELOPMENT, PRACTICE AND PROBLEMS

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Index: Web-based learning, Vocational English, On-line learning

Abstract: In response to the IT in education initiative by Hong Kong's Vocational Training Council, a project on web-based vocational English course was carried out at the Language Centre of Hong Kong Institute of Vocational Education (Tsing Yi) in September 1999. This project aimed to find out how to enhance language learning through integrating web-based and classroom-based activities. A survey was administered to investigate students' response to this type of learning experience. In this paper, the development of the web-based activities and the integration process would be described and the survey results would be discussed.

INTRODUCTION

Hong Kong Institute of Vocational Education (HKIVE) is the largest institution in Hong Kong to provide vocational training and education under the Vocational Training Council (VTC) of Hong Kong. It is composed of nine campuses in various locations in the territory. Language modules, offered by the Language Centre of each campus, form part of the formal curriculum in all the courses that HKIVE offers.

The Council is committed to using information technology as one of the modes of course delivery. The plan is that over a 5-year period up to 2004, 75% of the curriculum for HKIVE's courses are to be web-based (45% for presentation and 35% interactive). Currently most language modules are classroom-based, supplemented with computer-assisted learning activities. In response to the commitment, the authors in the Language Centre, HKIVE (Tsing Yi), initiated a project to explore the possibilities of integrating web-based materials into a vocational English module.

DEVELOPMENT AND INTEGRATION

The project started in September 1999. A block of four lessons on job application were chosen in the Technical English module for the second year students in the Department of Electrical and Telecommunications Engineering at HKIVE (Tsing Yi). The block consists of four units, namely, Job Advertisement, Resume, Job Application Letter and Job Interview. Web-based learning materials were developed and a website was set up.

There are a few assumptions underpinning the design of the project.

1. **Involvement:** As cited in Nunan (1991, pp.171), Rubin and Thompson characterise efficient language learners as those who 'make their own opportunities, and find strategies for getting practice in using language inside and outside the classroom; use mnemonics; are creative and experiment with language'. The web-based tasks would provide opportunities to engage the students with language activities outside the classroom. Despite different learners and learning

styles (Cotton, 1995; Tennant, 1988), the depth of participant involvement appears to be essential. The web-based tasks were designed in such a way that the students should become involved in and committed to their own learning.

2. **Motivation:** Bork (1992) points out that many studies for years have shown that the amount of quality time spent at a learning task is one of the most important factors in determining how much and how well students learn. People will spend more time learning if they like what they are doing. Apart from the topic being of interest to the students, some kind of incentive could be built into the activities to encourage students to learn.
3. **Independence:** To be independent in learning means that the students should be able to manage and monitor their own learning, and decide their pace of learning. Many students find it difficult to cope with tasks in English requiring an independent approach. As a result, they are often confused and passive in the face of the new demands placed upon them and many are unable to achieve the maximum academic performance (Watkins and Biggs, 1996). The delivery of the web-based tasks should enable the students to work independently.
4. **Integration:** Since human interaction is essential for language learning, an integration of web-based and classroom-based activities would enhance learning.

The approach adopted in the design of the block was to integrate the web-based tasks with classroom teaching. It is believed that they would complement one another. The arrangement was that students were required to complete the web-based tasks before the lessons. Students were given guidelines on how to use the web-based materials and worksheets to complete in addition to the tasks presented in the website. In order to encourage involvement of students, the materials were made as interesting and challenging as possible. Each unit would require about an hour to finish. A quiz, as an incentive to encourage the students to complete the web-based tasks, was given at the beginning of each lesson. Follow-ups on what students had learnt and extended activities were then done in class. This integrated approach takes advantage of what modern technology can offer and more importantly recognizes the specific nature of language learning, that is, human interaction as an essential part of the learning process. The block was delivered in February 2000 over a period of four weeks.

THE SURVEY

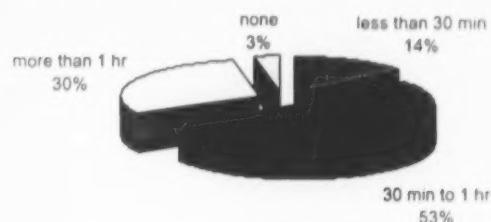
A survey was carried out at the end of the block with a sample of 173 students. They were all year two students studying higher diploma in the Department of Electrical and Telecommunications Engineering at HKIVE (Tsing Yi). The purpose of this study was to investigate the students' response with regard to the assumptions underlying the design of the project as discussed above. A questionnaire was administered to collect data for analysis.

ANALYSIS AND DISCUSSION

Involvement: The tasks in each unit would require about 1 hour to finish. As shown in figure 3, 53% of the students spent 30 minutes to 1 hour on each unit. Quite many (30%) spent more than 1 hour. This reflects that the majority (83%) of the students did spend sufficient time in doing the web-based activities. It shows how much they were involved in the tasks.

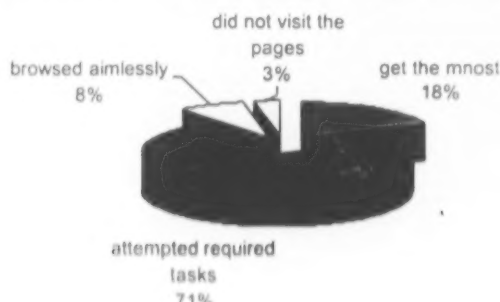
The findings also reveal that some students (17%) spent none or less than 30 minutes on the tasks. Apparently these students were not very much involved in the learning tasks. This may be related to whether these students were willing to take up responsibility and what kind of motivation they may have as discussed next.

Figure 3. How much time did you spend on the web-based activities?



When asked how much effort they paid in doing the tasks, the majority (71%) of the students expressed that they just attempted the required tasks as told (figure 4). This reflects that these students took up only minimal responsibility for their learning, that is, just enough to finish the tasks as assigned.

Figure 4. How much effort have you paid in doing the web-based exercises?



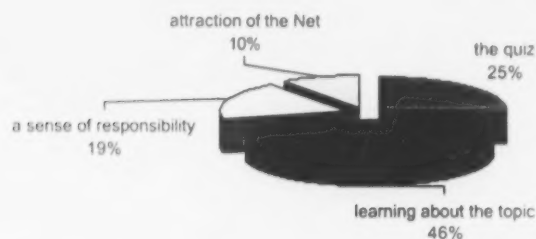
A small number of students (around 10%) indicated that they either browsed through the pages aimlessly or did not visit the website at all. This is consistent with the results in the question discussed above. These students did not take up as much responsibility as necessary to finish the web-based activities. However, almost one fifth of the students attempted the tasks because they tried to get the most out of the activities.

On the whole, the results show that basically most students (89%) have a positive attitude towards taking up responsibility for their own learning. The web-based activities hand over the responsibility of learning to the students. It is believed that to be more effective and efficient in learning, students should take up more responsibility in their own learning.

Motivation: When the teaching block was first designed, it was felt that job application would be of interest to the students. Also, it was believed that a quiz after each unit can motivate the students to complete the tasks. However, the survey shows that the number of students who did the web-based activities because of the quiz amounts to only a quarter of the total. This did not coincide with the hypothesis that follow-up quiz would be a strong motivation for the students. Rather, "the

desire to learn about the topic" was an even more important reason as 46% expressed that that was the most important reason (figure 5). This confirms that the choice of the topic was right. 19% of students completed the tasks out of a sense of responsibility. This matches with the findings from another question on how much effort they have paid in doing the web-based tasks, as discussed above. This may lead to the conclusion that intrinsic motivation (e.g. interest in the topic) would be a stronger drive than extrinsic motivation (i.e. quiz) for students to learn.

Figure 5. The most important reason that has made you do the web-based exercises?

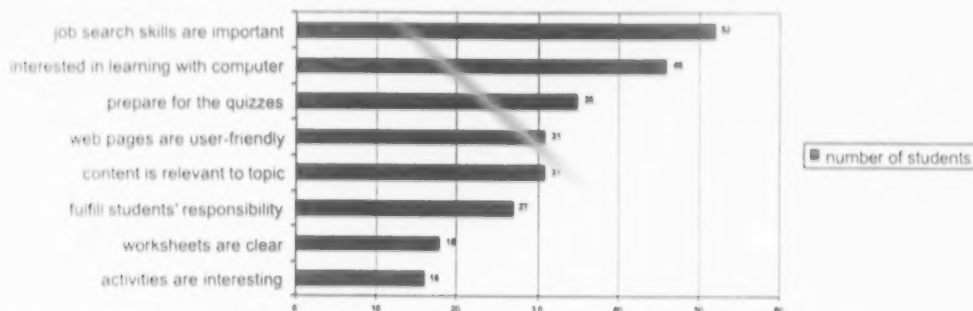


It is not surprising that only 10% responded that they did the tasks because of the attraction of the Net. Having done a survey of available multimedia learning materials, Clark and Craig (1992) concluded that multimedia is not the factor that influences learning. This again confirms that the topic rather than the medium is a more significant motivating factor.

Students were asked the reasons that had made them do well in the tasks and more than one option was allowed from a list. As revealed in figure 6, the reason with the most ticks is that job searching skills are important to them. This further confirms that motivation coming from within the students would have much more influence on students' motivation to learn.

The reason with the second most ticks is their interest in learning through the computer. This seems to be in conflict with the previous question about reason for making them do the web-based activities. This could be explained by the different formats of the two questions. Only one option is available in the former question while in the latter one students can choose more than one. Since

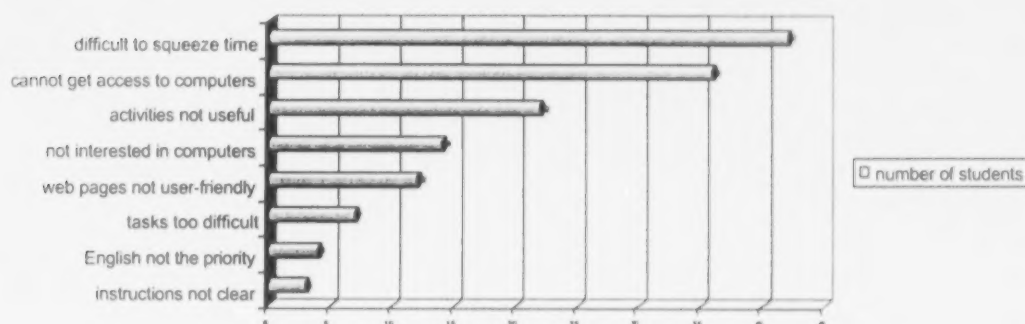
Figure 6. Reasons for doing the exercises well



the most important reason is related to the significance of the topic itself, only a small percentage goes to the attraction of the Net. Therefore, the results are not contradictory.

Independence: Students were asked to indicate why they had not done the tasks well. As shown in figure 7, the two most prominent factors are "difficulty to squeeze time" and "cannot get access to computers". Other factors are not as significant. This may reflect the way that the students manage their time, particularly on allocating time for learning. An independent student should be able to take control over his learning. As in this case, the students needed to make arrangement to complete the tasks by themselves, their performance in the tasks would therefore be highly attributed to how they manage their time. If the unit is entirely classroom-based, the time factor is unlikely to be a

Figure 7. Reasons for NOT doing the exercises well



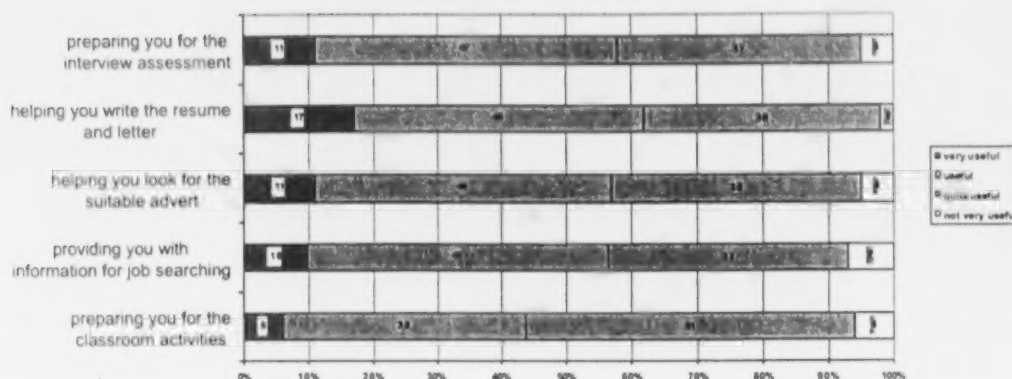
problem.

As for the other reason of "cannot get access to computers", this also demands the students to plan ahead. The computer rooms are open for free access throughout the week at different times in the campus. If the students really want to complete the task, they can by planning and reserving time slots well in advance.

Integration: It is believed that a combination of web-based and classroom-based activities would enhance learning. Figure 8 shows what the students thought about the usefulness of the web-based activities.

On average, around 56% of the students thought that the web-based activities were very useful and useful except for the usefulness in "preparing you for the classroom activities". Only very few students thought that the web-based activities are not useful.

Figure 8. How useful are the web-based activities?



CONCLUSIONS

While it is impossible to reach definitive conclusions, a few things are worth noting:

1. Web-based learning would invite more involvement from students. Having to spend one hour or more on the web-based activities has made students more involved in their own learning. As they already got some information from the web-based activities, they were better prepared for the classroom learning and participated more actively in class.
2. Students are more likely to spend time and effort on what they perceive to be important or interesting to them. Intrinsic motivation plays a crucial role in motivating students to learn. If learning is a terrible task, students will keep at it only through the use of external incentives/threats.
3. Multimedia materials presented through the web do not necessarily become motivating for students. Motivation must come from the desire to learn rather than the mode of learning or other external incentives.
4. Web-based learning demands students to be more independent. Unlike classroom-based learning, students need to allocate time to finish the tasks. This was found to be rather difficult for students who have not been trained to learn independently under the current education system. Training should be provided to students to help them develop skills that are required to be independent learners.
5. The integrated approach is perceived to be successful in enhancing learning.

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ESTABLISHING A VIRTUAL BUILDING & CONSTRUCTION SITE FOR EDUCATION AND TRAINING

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Index: Courseware Development; Instructional Technology; Building & Construction.

Abstract: Field trips, site visits and industrial placements can make an important educational contribution by bridging the theory-practice gap through the provision of vital contextual information and the promotion of insights not easily understood in the normal classroom. But, in the Building and Construction industries it is increasingly difficult to arrange actual sites visits. An alternative web site solution is described in this paper. The City University site, the *Virtual Building and Construction Environment*, is part of a much larger group of sites known as *CIVCAL*, developed by four Hong Kong universities. Access is provided to three tours, three building sites, information in a Design Office and Production Office as well as details of some outstanding construction projects in Hong Kong. The paper explains the underlying design methodology and production techniques, including features incorporated to promote learning and comprehension.

INTRODUCTION

There are a number of traditional approaches that provide "real world" experiences in education and training. Particularly in post-secondary settings, the real world is brought to the classroom through such activities as guest speaker presentations, laboratory experiments and video presentations. It could be argued that practice exercises and demonstrations serve the purpose of showing the application or real side of the learning material.

An obvious contrast to providing in-class practical experience is to take students to the 'real world'. Traditionally this is achieved through a range of activities from short-term excursion to longer-term clinical or industrial placements.

Some important factors influencing the educational effectiveness of these activities are organizational logistics, the degree of guidance and supervision, preparedness of participants and follow-up/consolidation. Obviously the participant's focused involvement is vital and preparatory talks and supplementary materials, process observation sheets and report requirements often address this issue.

Field experiences can suffer some disadvantages from uncontrollable influences such as inclement weather, increased travel costs and industrial disputes. Late changes in, for example, the production/construction schedule or safety/security arrangements can cause anything from a minor inconvenience to a complete disaster.

These activities 'in the field' *can* provide exciting contextual learning, prompting insights and sensory experiences that are difficult or even impossible to provide in the normal classroom. The advantages of good actual experiences should not be underestimated and careful consideration should be given before they are entirely removed from the curriculum. This could occur with the overzealous use of immersion Virtual Reality.

The education purpose of such reality enhancing strategies needs consideration. Overall, they provide a means to bridge theory and practice and facilitate contextual learning. Contextualised experiences encourage meaningful learning and transfer of knowledge to both problem-solving situations and real-world events. Also, the provision of multiple stimuli can arouse interest and focus attention. In particular, rich visual environment can promote pattern recognition enhancing memory and recall. This contrasts with many areas of instruction that depend on learning of lists out of context (i.e. meaningless learning).

Other "teaching strategies" aimed at enhancing reality in the classroom include various combinations of role-playing, simulation and educational games. Different media types or technologies are frequently used to support such strategies. Computer and communication technology has played an increasing role in these strategies over the past 30 years. So much so that for example, some science, manufacturing and commerce activities "in the classroom" (i.e. conducted in a "formal course") are actually part of a real-world event. This paper describes how the preceding ideas were taken into consideration and applied to creating a web site in an area of applied science.

The project described is part of a larger project, known as CIVCAL that provides a comprehensive teaching/learning environment for students in many aspects of civil engineering. CIVCAL is an inter-institutional project between four Hong Kong universities: University of Hong Kong (Coordinator), Hong Kong Polytechnic University, Hong Kong University of Science & Technology and City University of Hong Kong. The project is now in its final stage having been developed over 2 years.

A more detailed account of the conceptual and theoretical underpinnings of the web design and the anticipated cognitive outcomes is enunciated in a forthcoming paper by the authors (Wilkins and Barrett, 2000).

NEEDS AND DESIGN CONCEPT

The project evolved out of a need to provide civil engineering students in Hong Kong with current, interesting and appropriate information about local construction projects. The aim was to provide multimedia materials relating to some of the larger construction projects.

The initial proposal for delivery was a multimedia form of encyclopedia on CD-ROM. After analysis and discussion the educational concept was extended and the ideas of a 'virtual site visit' became the design metaphor. Following submission of a joint proposal, the University Grants Committee duly funded the project.

The original idea of concentrating on one or two large sites (the Chak Lap Kok airport project and/or the Hong Kong Convention & Exhibition Centre) was modified after curriculum and resource considerations. Each university concentrated on their area of specialism and following agreed guidelines, set about producing the learning materials.

Due to advances in technology, it was later agreed that the project would be web-based and that CD-ROM would be produced as a secondary form of delivery. This decision facilitated access and lowered distribution arrangements and costs. It also had technical and production implications, for

instance, the nature and quality of video that could be delivered over existing and predicted networks had to be taken into account.

The sub-set site developed at CityU is known as the "*Virtual Building and Construction Environment*". It followed the 'virtual site visit' metaphor and is specifically designed to support teaching/learning in building and construction technology. Our approach which is described in this paper and viewable on the website was the creation of multimedia displays and interactive activities in relation to construction processes of actual buildings in Hong Kong.

DEVELOPMENT

This section briefly describes the development process through the design, production and trial phases.

The 'virtual visit' metaphor provided a referential framework for content and assisted navigation and interface design. In this sub-project we focused considerable effort on capturing content. Knowledge engineering methods were used to identify and organize content. A series of work-group meetings concentrated on such teaching aspects as curriculum demands, overlap and gaps between courses and expected outcomes of the student learning experience. The practical, "reality", aspects were also considered including what kind of site visits should be included and what aspects of construction are important.

Faculty expressed many differing views while invited students made a significant contribution. But, to identify the core ideas and underlying structure of content, the Concept Mapping methodology was introduced. This technique of diagrammatically representing content by showing concrete and abstract concepts and their relationships proved invaluable in 'pinning down' a diversity of ideas (concepts) and their relative importance as expressed in terms of their contribution to a users (students) understanding of the content. Results of this process contrast with traditional topics-based structure or that based on how a lecturer may have learnt the material. The resulting map of the domain of building and constructions enabled selection of core clusters of concepts and prioritising these for development.

The above activity is part of the team-based approach to development employed at CityU (Barrett, 1999). In this model, content experts work with technical and instructional designers to produce the pre-production materials. Outcomes include the concept maps, conceptual diagrams, flow-charts, content scripts, screen designs and storyboards. A prototype was produced firstly using a commercial presentation outliner and then as a 'Powerpoint' model which enabled the overall design to be reviewed for functionality and navigation.

These design and prototype exercises provided clarifications of the key components and give directions as to how they would to be produced. It was decided that content could be grouped to show Low Rise, Medium Rise and High Rise housing in Hong Kong, highlighting the techniques applicable both across and unique to each group. Exemplars of each group were identified as respectively the Academic Exchange Building (AEB) on CityU campus and the Harmony and Concord buildings of the Hong Kong Housing Authority. The materials structured under these three areas, (and related icons) were designated the "site visit" within the Virtual Building and Construction Environment.

To further interest, contextualise and consolidate information, three time-based presentation were made. These are designated as the "Site Tours". The AEB consists of a condensed video time-line of the construction with voice-over explanations (i.e. through a virtual tour guide). The second demonstrates and explains the construction of a Harmony Block while the very latest technology is shown using stop-action photography for the Concord Block.

Two other 'virtual buildings' house relevant core content in the Design Office and Production Office. Material is interrelated throughout the virtual environment and additional links allow further exploration.

To enable expansion, a special link to Other Projects is produced in order to add new concepts and recent examples of innovative Building and Construction technology.

One member of the team has produced an extension photographic and descriptive review of recent outstanding projects in Hong Kong (Wong, 1998). Through arrangement with the publisher, this material has to be edited to appear on this site. Gathering and editing content and preparing media elements was a demanding task carried out by content specialists with the work of a research assistant. Pre-production activity of locating, sorting and editing of text and other media requires considerable time and dedication.

PRODUCTION

The Courseware Development Laboratory (CDL) is a dedicated facility for producing educational and training materials on CD-ROM or Websites. It houses all needed facilities and is staffed by qualified and experience personnel in order to provide programming/authoring, graphic art/animation and project design and management. Specialists in the (CDL) carry out web authoring and graphic production.

Again, within the team-based model, individuals work as a node within a specialist network of co-ordinated activity. Work-group sessions, including review activities, keep the need for reworking to a minimum. The outcome is a consistent look and feel and ease of navigation. These aspects will become evident in visiting the web-site <http://civcal.media.hku.hk/>.

INITIAL EVALUATION

Preliminary tests with undergraduate students of the Building & Construction Department have shown that students find the web site useful in enhancing their understanding of the concepts and techniques relating to the on-site assembly of buildings. Two tests have been run with two groups of students based on evaluation by questionnaire:

Group 1, studying construction engineering and management, evaluated the site one year ago at a very early stage in its development. This group had already been studying construction technology and engineering subjects for almost two years. The group, and its tutor, a civil engineer and full-time member of the academic staff, found the site extremely helpful in providing an overview of the construction process, even at this early stage in development:

Group 2 (over 100 students), was studying in a common first year and would eventually concentrate on construction engineering and management, quantity surveying, or building surveying. The group was first introduced to the web site by the authors and members of the CDL team during a course in Construction Communication. The site was subsequently used by one of the co-authors to teach aspects of building construction technology. Specifically it was used as a "virtual site visit" after a series of lectures and tutorials in technology subjects relating to individual components and building elements - substructure, wall construction, floor construction, roof construction, windows, and doors. An assignment was subsequently set requiring students to respond through the web site to questions posed relating to various production processes. Eventually a questionnaire evaluation was conducted to obtain feedback relating to the students' overall experience of the web site. Again there was unanimous agreement that it provided a useful learning experience, specifically in that it

enabled students to integrate the individual building elements and components studied in the previous lectures and tutorials. The site visit concept was well liked and the video, time lapse and animation sequences appeared to be particularly helpful in viewing overall construction processes, which could then be examined through more detailed visual and text material on the web site.

A comprehensive student evaluation will be conducted in the first semester of the 2000/2001 university teaching year.

SUMMARY

Practical, "work experience" activities have the advantage of contextual learning fostering integration of knowledge and promoting affective awareness. Under well-organized and well-supervised conditions, different forms of site visits have much to offer. But interruptions, interference and conflicts in purpose often diminish the learning experience to the extent of making it unproductive.

Reality enhancing procedures such as simulation, gaming and role-playing have often been added to the traditional mixture of lab experiments and projects. In addition, computer simulated environments of various kinds can be introduced to promote interest, application and transferability of knowledge for the purpose of bridging theory and practice. Taking these ideas into account, we have designed and produced a web-based environment founded on knowledge engineering techniques and employing multimedia and communication technology.

We have attempted to employ the most efficient means of development through team-based networking. Specialists using the appropriate tools in suitable facilities carry out actual production.

Also, as this material has broad delivery, only limited by web access, it is suitable for distance learning, vocational and professional continuing education. In addition, the general model could easily be extended to provide on-the-job training or act as a Decision Support System.

The content organisation and associated functionality underlying this project is in direct contrast with the random collections, or even topic-based collations, of materials frequently encountered in web course materials. Moreover, what is not immediately evident is that users (students) are exploring the information provided according to a highly designed representation of declarative knowledge. This emphasizes the building of 'conceptual structures' of the knowledge base. Also, users view the material in context and sequentially (through time-based sequences in the virtual tours) which promotes development of procedural knowledge. These processes foster schema formation and consolidate understanding. The project has also makes extensive use of multimedia elements not for "entertainment" but to promote student learning through multi-sensory perception and pattern matching processes.

Developing good quality learning materials is demanding and resource consuming. It is important then, that the educational purpose, learning experience and outcomes be paramount in producing web-based educational materials. Application of design principles from Instruction and Cognitive Science is imperative if the learning experience is to become more effective. Production and implementation raise important issues relating to efficiency. The web site described in this paper, while still having room for expansion in terms of content and learning activities, demonstrates one collaborative effort that provides students with relevant, accessible and thought provoking materials.

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THE WEBVOLUTION'S IMPACT ON VOCATIONAL CLASSROOMS AND ADMINISTRATION

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Index: Internet/WWW, IT Costs, ASP, Communications, Security, Connectivity

Abstract: We are eyewitnesses of a Webvolution; a revolution brought about by the explosion of the Internet and the World Wide Web (WWW). Few innovations have been embraced more quickly than the Internet. The current trend of the Internet will change the face of education, as we know it. Almost every public school in the United States has Internet access and other countries are adopting these technologies at a rapid pace. The Internet is perhaps the first truly global environment. This paper will explore the potential of utilizing the WWW as a resource for vocational classrooms and administration. It provides informative information on such topics as: (1) true cost of information technology ownership; (2) using an Application Service Provider (ASP); (3) using the Internet as a communication tool; (4) data security issues; and (5) fundamental changes in the infrastructure requirements of information technology.

INTRODUCTION

Leaders all over the world realize that the most precious natural resource of any country is its children and that technology is key to education [10]. The Internet and the WWW are ubiquitous. In the United State alone, educational institutions are spending billions of dollars on technology in an effort to improve learning and increase productivity. Nearly every public school in America (95%) now has access to the Internet, and the goal is to have every school and classroom connected to the Internet by the end of the year 2000 [17]. Schools all over the world are receiving assistance from a number of organizations and programs in an effort to get "connected". For example, The World Links for Development (WorLD) program has shipped hundreds of computers, resulting from an internal upgrade, to many universities in Africa [5]. Their goal is to have full Internet access to each of the sites. The "Singapore ONE (One Network for Everyone) initiative" plans to develop a nationwide broadband network that will link homes and schools [15]. The WWW is an incredibly vast resource for stakeholders involved in the education progress.

The remainder of this paper presents a framework for discussing the impact the Webvolution can have on vocational education as it relates to classroom management and administration management. It will examine the total cost of ownership (TCO) of information technology. The paper will examine current trends of outsourcing with application service providers (ASPs) in a hosted environment as a means of deploying software applications. It will explore the potential of utilizing the WWW as a resource for "real-time" collecting, organizing, analyzing, and communicating information. Subsequently, the paper will examine security issues as they relate to storing information. In addition, it will examine the impact the WWW and web appliances could have on reducing infrastructure requirements thereby making computer technology available to a greater number of educational institutions worldwide.

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Total Cost of Ownership

"Beliefs about total cost of ownership are, like religious convictions, intensely held and widely diverse" [Gibson, 20]. Kirwin defines TCO as, "...a holistic view of cost related to information technology acquisition and usage at an enterprise level" [qtd. in Gibson, 20]. Quantifying IT costs and benefits is very difficult if not impossible. Some costs are obvious such as the initial price of hardware and software. However, Gartner Group Inc., [cited in Gibson, 1997] has long contended that other costs such as upgrading, training, maintenance, and technical support are many times the PC's initial purchase price. It is estimated that TCO for a PC on a local area network costs somewhere between US\$9,000 and US\$12,000 per user per year [4]. Information technology should be seen as cost effective; however, if technology is taken down the wrong path, it could prove to be very costly. TCO is a legitimate concern that must be constantly evaluated. Schools should be looking to web-based applications as a means of reducing IT costs.

Outsourcing with ASPs

One of the biggest IT costs for schools is buying prepackaged applications for in-house use; however, this may become a thing of the past. As schools struggle to find new ways to collect, analyze, and share information and reduce IT costs, one revolutionary approach is to use what is known as an application service provider (ASP). The ASP market represents a fundamental paradigm shift from the traditional ownership of software licensing and services to outsourcing. An ASP is an independent, third party provider of software-based services, which are deployed to customers across a wide area network [1].

ASPs can prove to be cost effective because the school needs no in-house application servers or database servers to support the applications. Rather, ASPs provide services to implement, host, and maintain application software and IT services in a hosted environment. Web browsers provide a standard way to interact with an ASP system and neither the Internet nor browsers add much cost to the outsourcing equation. Other not so obvious IT costs include maintenance and support. ASPs have the potential to simplify these issues according to advocates of the approach. Boyd [cited in Bushweller, 2000] contends that regularly updating information requires information technology expertise that schools don't have. According to Boyd, this is especially the case in small to medium-sized districts that can't afford to hire teams of information technology specialist. ASPs can relieve customers' installation and system-support hassles and give customers browser-based web access. McKie [9] contends that outsourcing with an ASP is certain to be part of the future of every organization in the Internet age.

Virtual Communication

"The most important information we have to communicate to parents is about their own children" [Reid, A24]. While research shows that student learning is maximized through parental involvement [20], keeping parents informed takes valuable time and resources. In an effort to address this problem, many U.S. State legislatures are mandating that schools embrace the power of technology to bridge the communication gap. For example, under Utah's 1999 Digital State law, schools must make "reasonable progress" toward making student information available via the Internet by July 1, 2002 [19].

The real value of the Internet is not in its ability to reduce costs or infrastructure requirements but in its ability to make the data available to the appropriate parties at the most opportune time. The information must be easily accessible to authorized users, and with the help of web-based services, school administrators and teachers have the ability to make pertinent school information readily available to governing bodies, parents, and students. As access to the Internet becomes more

universal, parents can assess their children's current progress on their own web devices. For example, one of the most fundamental types of school-to-home communication is the report card. Producing a report card in the traditional manner can be very disruptive to the instructional process. However, if schools were to apply the concept of "anywhere, anytime" reporting to the grade report system, parents and students could produce a progress report on demand without intruding on the learning process.

More and more software programs are utilizing the Internet as a communication tool. For example, Excelsior Software and National Computer Systems Inc., both promote using the web as a tool for connecting school and home. However, many schools are prohibited from using many of the products on the market due to the costs involved. FreefromIT.com, an ASP, provides a solution that any district can afford. They have developed a "free" web-based classroom management system (<http://www.classroll.com>). The company is unique in that it can offer its product at no cost to schools because it generates revenue by advertising banners on its website. Because the programs and the student data are stored and hosted by Classroll.com for free, the only thing that is needed to access the product is a web browser. Most experts think it's not a question of whether schools will be communicating with parents via the Internet, but where and when. Companies such as these will play a crucial role in helping schools move to the new era of "anywhere, anytime" computing.

Data Security

On May 3, 1999, a devastating tornado ripped through Oklahoma killing people, destroying businesses and schools, and literally wiped towns off the map. While most school see the necessity of securing computer equipment against such disasters, they fail to protect their most valuable asset; information. Computers cost money and therefore should be considered a valuable asset. However, when districts take a moment to consider why they are so willing to invest large amounts of money on computer equipment—to store, access, and transmit information—the value of that information becomes more obvious. In the education community, information about students, staff, and other resources is far more valuable than the most costly equipment. There are countless examples of how data can be destroyed; theft, vandalism, and hacking, just to name a few. Sharing data via computers and networks has proven time and time again to be a cost-effective way of getting things done; however, inappropriate access using this type of technology has emerged as one of today's highest-profile data security issues [18].

The safeguard to the destruction of data is to keep a copy of the data in a different location, known in the technological world as "off-site" back-ups. Technology makes it affordable and relatively simple; however, far too many of those responsible for the off-site back-up fail to see its significance. It would only take one catastrophe like the example given above to realize the significance of an off-site back-up. Safeguarding data from inappropriate access requires constant monitoring and a tremendous amount of technological expertise. The idea of outsourcing with an ASP rather than having the data stored on an in-house system is a security concern for many schools. However, Stacy Boyd, president and CEO of Project ACHIEVE, a San Francisco based ASP and former middle school principal, [cited in Bushweller, 2000] contends that information is no less secure at an ASP site that it is in-house. Outsourcing with an ASP is one way of ensuring that your data is secure. After all, safeguarding is their business, educating is ours.

Connectivity

Access to computers and the Internet and the ability to effectively use this technology are becoming increasingly important for full participation in a global society. The Internet has made great strides in eliminating the issue of distance and geography. As of March 1999, it was estimated there were

more than 200 countries connected to the web [7]. The art of estimating how many individuals are online, throughout the world, is an inexact one at best; however, it is estimated that 304.33 million people were online as of March 2000 [11]. The following table shows the estimated global distribution by region.

Table 1		
Estimated Number of People On-Line		
Region	Number (millions)	Percentage
Total "On-Line" World	304.33	
Africa	2.58	0.85%
Asia/Pacific	68.9	22.64%
Europe	83.35	27.39%
Middle East	1.9	0.62%
Canada & USA	136.86	44.97%
South America	10.74	3.53%
Source: NUA Internet Surveys		
http://www.nua.ie/surveys/how_many_online/index.html		

It is estimated that sixty-six percent of U.S. households will be online by 2003 and seventeen percent of Western European consumers are expected to be online by the end of 2002 [13]. While this may sound impressive, it must be put in perspective. We share the same world and we share the same challenges. While the web is reaching an increasing number of people worldwide, we remain a "disconnected" world.

In the new information age, the majority of the people in the world do not have access to the most basic telecommunications infrastructures and its benefits. There are approximately six billion people in the world spread out over a billion households. Fewer than two percent of the world's population have access to the Internet [14]. More than half of those households do not have a telephone, much less electricity to plug in a computer [3]. For example, sixty-five percent of schools in Mexico do not have telephone access [8]. Where there is limited access to telecommunications, access to education is likewise limited. Unless the infrastructure is in place, those in most need of an education will continue to be at a disadvantage. While wireless technology is in its infancy, it and the ASP model may very well be the solution in ensuring that there is equal access to technology in schools around the world.

Currently, the PC is the primary tool with which to access the information Internet; however, that doesn't mean is the best way [21]. An alternative to standard landlines, wireless technology is becoming the communication method of choice for developing and industrialized countries around the world [16]. Wireless web devices such as the advanced cellular telephones with Internet browser capabilities is one such alternative to standard landlines. Qualcomm Inc, the developer of CDMA digital wireless technology, has developed a wireless local loop phone targeted toward countries with developing communication requirements that are currently without telephone service [6]. Using this type of wireless technology, telephone infrastructure can be implemented more quickly and at a lower cost than traditional landline service. Hosted applications provided by an ASP promise not only to reduce costs but because they can be located anywhere in the world, they can also reduce some of the local infrastructure requirements. Wireless technology, ASPs in a hosted environment, and web devices can be the solution in bridging the gap between the "haves" and "have-nots". Vocational Educators are often viewed as the leaders in technology. The

Webvolution is an opportunity for us to take the lead in discovering how we can use this technology to enhance the educational process.

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AUDIO AND VIDEO DEVELOPMENT FOR MULTIMEDIA AND WEB-BASED APPLICATIONS

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Index: Multimedia, Internet, Pedagogy, Curriculum Development

Abstract: Technology allows vocational education teachers to increase their delivery modes in the computer environment—from basically text-based to audio and video inclusion. In this session, appropriate video and audio usage, online audio and video sources, audio and video development options, and integration of audio and video into teaching tools will be emphasized. Available research on audio and video inclusion will be shared.

INTRODUCTION

Instructional technology continues to grow and evolve. Because of its increased use, more interest has been placed in its appropriate integration into teaching and learning. The longest-running effort of technology integration in schools is Apple's Classrooms of Tomorrow (ACOT) project. In these technology-rich schools, students work more collaboratively than in traditional classrooms (Newby, Stepich, Lehman, & Russell, 2000). They are comfortable with technology and use it to find information, analyze the information, and present their findings. In the ACOT classrooms, teaching and learning has been transformed with instructional technology as the catalyst.

The developments in computer power support the use of more and more sophisticated media in the instructional technology environment. In the near future, it will be common place to support audio and full-screen, full-motion video along with text and pictures. Web-sites, which are rich sources of information for both students and teachers, will become increasingly more interactive. Streaming audio and video (audio and video sent out per request over the Internet) will improve and open new opportunities for teaching and learning. In the future, education will be enabled by instructional technology.

Audio and video in the computer environment is a powerful way to capture students' enthusiasm for learning, energize teaching, and extend the educational community. Audio via the computer provides an additional medium for explaining a concept or idea. Computer video brings learning to life, builds bridges to higher-order thinking, provides visual examples, and brings people together.

This paper shows appropriate computer video and audio usage, online audio and video sources, audio and video development options, and directions for integration of audio and video into teaching tools use will be emphasized.

COMPUTER VIDEO AND AUDIO USAGE

Developing and using computer video and audio is "fun" but teachers must resist using these technology tools only because it is novel or because "everyone else is doing it." Technology merely provides educators with the tools for authentic learning (Schrum, 2000). There are a variety of reasons why teachers should consider using video and audio in the computer environment:

- Current information can be brought into the classroom.
- Case studies come alive.
- Difficult concepts can be explained.
- Special activities can be archived and used again (field trips, guest speakers, etc.)
- Student development of audio and video builds critical thinking and team building skills.

The pedagogy of computer audio and video use in the classroom should focus on how this technology lends itself to creativity, exploration, understanding, and documentation of knowledge learned (Schrum, 2000). Students become active versus passive learners, producing knowledge and presenting that knowledge in various formats.

ONLINE AUDIO AND VIDEO SOURCES

Audio and video sources are plentiful on the web but may not be appropriate for educational use. One of the best overall places to go can be found at the Excite website (www.excite.com/search/forms/audio_video_search/). At this web location, a teacher can search for a particular audio or video file format. Any search engine can be used to find audio or video by combining the topic area plus one or more of the audio and/or video formats. The most popular audio and video formats in education are defined below.

Audio

The most common audio formats in education are: WAV, AU, AIFF, SND, MIDI, and RealPlayer (.rm). The file format MP3 is also popular on the Internet but tends to be used for music files. WAV (with file extension of .wav) is a native Microsoft audio format. Because it can be played on a variety of computer platforms, it is one of the most popular types of audio file on bulletin boards and the Internet. The AU format provides a small file size but a poor quality sound, normally only an 8-bit, 8kHz monaural sample. An AIFF file is an Apple (Macintosh) interchange format. It operates in a similar way as a WAV file and can be played on various computers. SND is also a Macintosh format but can only be interpreted by Macintosh computers. MIDIs are electronic music files. The audio file format posed to take over the Internet is RealPlayer. Audio in this format can be played on computers with the RealPlayer plug-in.

Video

The three most popular video file formats are AVI, MOV, and RealPlayer. Window-based computers often use the AVI (Audio Video Interleave) format for digital video but this format can also be read by Macintosh computers. The Apple/Macintosh video development software called QuickTime produces MOV formatted files. QuickTime videos can be produced on either a Macintosh or Wintel machine. QuickTime 5.0, the newest version, seems to be a premier development tool for video, producing small files with outstanding video quality. The RealPlayer

video format has become a standard on the Internet. Both basic QuickTime and RealPlayer video development programs can be downloaded free.

Two key considerations need to be remembered in the development of audio or video files. First, what type of computer the files will be played on determines format. Because each format is compressed differently and if small files are needed, formats that have a more aggressive compression process would be a better choice. Secondly, what format you choose depends on the plug-ins your audience has on their computers. A WAV file plays on most computers without downloading additional plug-ins from the Internet. On the other hand, to play a RealPlayer file, the receiver of the file will need to have the appropriate RealPlayer plug-in on their computer.

AUDIO AND VIDEO DEVELOPMENT OPTIONS

To record sound, you need a sound card, a microphone, and a sound-capturing program. Audio can be developed through the sound programs that come with a computer. In a Windows-based computer, Sound Recorder is available; on Macintosh, Sound Manager. These programs have limited editing capabilities. For more sound editing options, programs as SoundEdit and SoundForge are inexpensive. RealPlayer and QuickTime can also be used to develop sound files.

Developing and editing videos for computer use is a more complex process. In general, a video card, approximately 96MB Ram, a "fast" computer, and video capture/editing software are needed. RealPlayer (www.real.com) and QuickTime (www.apple.com/quicktime) have free, limited functioned software available for download for video capturing, editing, and producing. Additional money can be spent to purchase "pro" versions of each programs. Other software products are available for video editing (as Ulead, MGI VideoWave, and Adobe Premiere) but are more complicated and are not necessary for most educational uses. Digital Origin also produces an easy-to-use video editing software.

Audio and video on the Internet can either be played after the file has been downloaded to a computer or immediately after clicking "play". The process of immediate playback of a video without downloading is called streaming. The advantage of streaming is that your audience will not have to wait for the downloaded file and the video clip (or audio) is erased from the computer as it is played. This feature is essential in the distribution of copyrighted materials.

Streaming of audio and video is increasing on the Internet. Three key video streaming companies exist: Real Video, QuickTime, and Microsoft Theater Server. If streaming is the goal, a web server with a large storage capacity is necessary. For example, a three minute movie that is 320 x 240 pixels running at an average frame rate will take up more than 600 MB.

Two other innovations in online video are SMIL and Surestream. SMIL (Synchronized Multimedia Integration Language) allows for the synchronization of a presentation that contains multiple clips or media. A teacher or student can combine pictures, video, and text for a truly interactive presentation. Surestream encodes the video or audio file one time but will play at multiple bandwidths. This capability is important if your audience will be downloading from a variety of "modem" speeds. RealPlayer and QuickTime both provide these innovations. More information about streaming video can be found at www.streamingmediaworld.com/video/tutor.

INTEGRATION OF AUDIO AND VIDEO IN TEACHING

How could audio and video be used in teaching? The most exciting possibilities are online video cases, simulations, and virtual tours. Online video cases are starting to appear in teacher education and technology will soon be common enough for all teachers and students to use. Video case studies allow for the presentation of a problem and engagement of viewers in critical thinking activities about possible solutions to the case. Online cases could also be used to present a student's project from its inception to conclusions and solutions.

Simulations also "tell" a story but provide multiple choices on how to solve the problem. Students view possible scenarios via video or audio segments. Based on their choices, students move throughout the simulation. Video and audio segments provide a more realistic context and allow students to evaluate verbal and nonverbal cues.

Virtual tours solve the problem of not being able to take students to all the great resources in business and industry. As field trips or visits are made, video and audio segments can be taken and then compiled into a "tour" format. Students can then proceed through the tour to gather relevant information.

SUMMARY

According to Jonassen, Peck and Wilson (1999, p. 3), "Knowledge is embedded in activity." In this sense, technology provides a means to embed knowledge in an interactive way for students. Technology provides a means to explore, motivation to explore, and a way to organize gathered information to gain understanding. The use of audio and video provide a way to increase participation in learning and engage more senses in the learning process. With the improvements in technology, more audio and video via the computer will be used in the teaching and learning process.

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